Final Report
February 8, 2019

Mango Internal Discoloration ("Cutting Black" or "Corte Negro")

Covering Phase I (1 July 2013 - 30 Sept. 2014), Phase II (1 Oct. 2014 – 30 June 2015), Phase III (1 July 2015 – 30 June 2016), and Phase IV (1 July 2016 – 17 Mar. 2017)

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Introduction

Funding for this project came in four stages, which we refer to as Phases I, II, III and IV; those funding periods encompassed four seasons for one farm in Peru, and three seasons for another farm in Peru and two farms in Ecuador. The project started too late in 2013 for the field trials to cover the entire production cycle in 2013-14. However, in Peru, the trials were begun in 2013 at the one farm mentioned above, with trees that were in bloom in September 2013. In Ecuador, a farm was identified on which excess N had already been applied in one section earlier in the 2013 season. Those farms plus an additional farm in Peru and another farm in Ecuador were included in the trials from the 2014-15 season through the 2016-17 season (**Table 1**). In the 2016-17 season, we added a cooperating farm in Peru with a history of *corte negro* to test our hypothesis that harvesting less mature fruit, which are more chilling sensitive, would increase the incidence and/or severity of *corte negro*.

Table 1. On-farm trials in Ecuador and Peru involve two farms in each country and different mango cultivars and start dates.

Location		Cultivar	Start date
Ecuador	Orchard 1	'Tommy Atkins'	Spring 2014
	Orchard 2	'Ataulfo'	Spring 2014
Peru	Orchard 1	'Kent'	Fall 2013
	Orchard 2	'Kent'	Spring 2014

Internal discoloration ("cutting black" or "*corte negro*") of mango fruit has been considered to be a preharvest disorder that develops its symptoms during ripening. The disorder has been a recurring problem with mangos from Ecuador and Peru exported to the U.S. The specific environmental conditions or cultural practices that lead to *corte negro* have not been determined. To address this lack of information, we initially conducted surveys of mango growers in Ecuador and Peru and importers in the U.S.A. in an attempt to identify when and where *corte*

negro has occurred and to collect information about the environmental and cultural practices that are associated with either the occurrence or absence of the disorder.

The ***overall objective*** of this project was to determine the cause of the internal discoloration disorder ("cutting black" or "*corte negro*") in mango fruit grown in Ecuador and Peru and how to prevent its occurrence.

The main ***hypothesis*** we tested was that mangos become predisposed to develop *corte negro* symptoms at some critical period of fruit development due to low Ca and/or high N (which interferes with Ca reaching the fruit). Because it can take several seasons to change the nutrient status of soil and mango trees, we conducted the fertilizer trials at the four cooperating farms for multiple consecutive seasons. We also tested the hypothesis that *corte negro* symptoms develop in response to stress from either the quarantine hot water treatment or postharvest chilling temperature.

On-farm trials of potential cultural solutions (varying the N and Ca fertilization rates in different ratios) were completed over three or four production seasons under the supervision of the project managers on site in the two countries. We sampled soil and leaves (at the beginning and end of each production cycle) and fruit at several fruit developmental stages (from early fruit development to maturity) from each test orchard for complete nutrient analyses. Internal discoloration incidence and the role of refrigerated storage in the occurrence of the disorder was determined over three (or, on one farm in Peru, four) full seasons of field treatments by holding hot-water-treated and untreated fruit from the test orchards at packinghouses in refrigerated (10°C/50°F) and non-refrigerated (24°C/75°F) storage, allowing the fruit to ripen at 24°C before checking for internal discoloration.

The results of this project were as follows:

- Our surveying efforts were not productive due to the low level of responses to our repeated requests for shared information.

- A possible role for quarantine hot water treatment in development of *corte negro* was disproven in the first two seasons of research. That treatment was discontinued in subsequent seasons.

- The field N and Ca treatments had little effect on soil, leaf, and fruit nutrient contents and no effects were seen on incidence of *corte negro* in the fruit.

- *Corte negro* occurred almost exclusively in fruit from refrigerated storage (3 weeks@10°C plus 1 week@24°C) with no difference among fertilizer treatments.

- Incidence of *corte negro* in fruit from the fifth farm with a history of the disorder was extremely high (66 to 88%) but did not show a clear effect of harvest maturity.

Objectives

The *specific objectives* of this research were to:

1. Survey mango growers to identify when and where *corte negro* has occurred: seasons, and times within seasons; locations; and varieties for past outbreaks. (We also wanted to trace back incidences of *corte negro* reported to us by importers in the U.S.A.)
2. Compare the historical survey results to climate records and cultural practices, especially fertilization (N, Ca, and other macro- and micronutrient application rates and application) and irrigation (amounts and timing), associated with farms that have either experienced or not experienced the problem.
3. Coordinate on-farm trials to induce/prevent the internal discoloration disorder by varying fertilization (specifically N and Ca), and other cultural practices as suggested by the survey results.
4. Conduct experiments in Peru and/or Ecuador using fruit from the above on-farm trials to determine the possible role of refrigerated storage treatments in inducing the disorder.

   In a modification to the Objective 4 procedure, in the 2016-17 season we adjusted fruit harvest maturity so that the mangos were harvested earlier, around maturity Stage 2, which corresponds to when mangos for export are typically harvested and when the fruit are more sensitive to chilling injury than later stages.

   Also, in the 2016-17 season, we added a cooperating farm in Peru with a history of *corte negro*, from which we harvested fruit three times for refrigerated storage corresponding to maturity Stage 1, Stage 2, and Stage 3 in order to help clarify the role of chilling injury in *corte negro* incidence.

Materials and Methods

1. **Project Managers.** One person was hired in each country (through subcontracts with FME and APEM) to conduct the surveys and field/packinghouse trials

   Ecuador: Ricardo Moreira Macías, then Vincente Alvarez

Peru: Johana Ramirez Mogollón

2. **Survey.** Separate surveys for growers, packers and importers were distributed in order to collect information, including: historical incidence of *corte negro*, climate records, cultural practices, and postharvest practices

3. **On-Farm Trials.** Designed to either induce or prevent *corte negro*

   Replicated fertilizer trials with normal versus high N, normal versus low (no) Ca, and combinations of the above, applied to trees in two orchards each in Ecuador and Peru.

   Initial soil and leaf nutrient analyses were conducted for trees in each fertilizer treatment prior to initiating field trials. Soil and leaves were also sampled for nutrient analyses after fruit were harvested in each orchard. Fruit samples from each treatment were sampled 6 or 7 times during each season for macro- and micronutrient content from early fruit development through to fruit maturity.

   The percentage of disordered fruit at harvest and after +/- hot water and refrigerated storage plus ripening were determined and related to fruit nutrient content.

   The same farms in Ecuador and Peru were included throughout the entire project. For each treatment and replicate, the same trees in each orchard are being sampled each year because tree nutrient content is cumulative, and trees also store nutrients from one year to the next. Therefore, we anticipated that it may take a few years for a fertilizer treatment to be expressed in terms of leaf and fruit nutrient content.

4. **Postharvest Experiments.** In the first one or two seasons, depending on the farm, fruit were either subjected to the quarantine hot water treatment or not and were then either placed into refrigerated storage at 10^{o}C (50^{o}F) for 3 weeks or into ripening conditions (24^{o}C air-conditioned offices) for 1 week; after 3 weeks in refrigerated storage, those fruit were also placed into ripening conditions for 1 week. All fruit were ripe at the time of cutting to check for *corte negro*. Because no effect of hot water treatment on *corte negro* was observed in seasons one or two, subsequently all fruit in the remaining seasons received the hot water treatment.

Postharvest experimental design (4X4 factorial arrangement = 16 treatments):

Fruit from these preharvest treatments:	**Postharvest treatments applied:**
1. High N/Med or Low Ca	1. No hot water, ripening at 24°C (ambient)
2. Higher N/Low Ca	2. No hot water, 3 weeks storage at 10°C, then allowed to ripen at 24°C
3. Low N/Med or High Ca	3. Hot water, ripening at 24°C (ambient)
4. High N/High Ca, or High N/Low Ca, or Low N/Low Ca	4. Hot water, 3 weeks storage at 10°C, then allowed to ripen at 24°C

During the 2015-16 season, a farm in Peru with a history of *corte negro* was identified through a traceback event. We set up an experiment with that farm during the 2016-17 season in which fruit were harvested three times, with the fruit being primarily at Stage 1, then Stage 2, then Stage 3 maturity in each successive harvest. Those fruit were treated as described above.

Results

Objectives 1 & 2 – Surveys. Growers and packers were surveyed in Peru and Ecuador. Anecdotal evidence suggested that *corte negro* occurs during ripening, but only after refrigerated storage/transport, with or without hot water treatment. Survey results related to possible involvement of climate and production practices in *corte negro* provided the following results:

- Background data collected:
    - Monthly ambient temperatures, rainfall and irrigation rates
    - Previous soil and leaf tissue analysis data
- Project data collection (2013-17):
    - On-site monthly weather – ambient temperatures and humidity
    - Nutrient analysis (N, P, K, Mg, Ca, Fe, Zn, Cu, Mn, B)
    - Soil and tissue (leaf and fruit)
    - Incidence of cutting black
    - Fruit diameter during fruit development
    - Postharvest treatments (described later)

Producer surveys

- Percent cutting black by cultivar
    - 0 - 7% 'Kent'
    - 0.5 - 30% 'Tommy Atkins'
    - 0 - 10% 'Ataulfo'

- Producer additional comments
    - The incidence of cutting black does not seem to be consistent within an orchard location

- Producers reporting cutting black
    - 56% reported 'Tommy Atkins'
    - 22% reported 'Ataulfo'
    - 22% reported 'Kent'
    - No reports so far on 'Haden'

- We were able to trace back to several farms from shipments with cutting black in the U.S. and include those farms in the surveys

- Fertilizers reported used:
    - $CaNO_3$
    - KNO_3
    - NH_3NO_4
    - NH_3SO_4
    - MAP
    - DAP
    - Urea $[CO(NH_2)_2]$
    - KCl, KSO_4
    - Hydrated lime, Ca(OH)2
    - Gypsum ($CaSO_4 \cdot 2H_2O$)
    - $MgSO_4$
    - $ZnSO_4$
    - Boron
    - Phosphorous acid

- Plant growth regulators:
    - Paclobutrazol (67%)
    - Ethephon (71%)
    - Gibberellic acid
    - Auxin

Importer surveys.
We experienced a lot of difficulty getting importers to complete surveys. The number was too low to allow any general observations.

Objective 3 – On-farm Trials. When we received the funding for Phase I and went to Peru and Ecuador, the mango season had either started or was about to start. By the time we hired our project managers, the season was underway.

We originally assumed that all growers in Peru and Ecuador were applying too much N and not enough Ca and were not spraying Ca early during fruit development, which is very common throughout the world. We also assumed that most orchards had *corte negro*. Therefore, our original plan was to reduce *corte negro* by reducing the amount of N in the soil and increasing foliar Ca applications during early fruit development. However, when we went to Orchard 1 in Peru, they told us that they never had *corte negro* and we were surprised to find that they applied a lot of foliar Ca early during fruit development and much less N (about 3-5 times less than normal; that is they were surprisingly already

doing what we assumed would possibly be the solution to *corte negro*).

Therefore, this unusual situation provided an unexpected opportunity to try to cause *corte negro* in Orchard 1 by increasing N and decreasing Ca. Also, Orchard 1 was the only orchard ready to let us conduct the study immediately, although they already had applied 50% of their fertilizer treatments for that year. So, we set up treatments to increase N and lower Ca applications even though they were part way through the growing season. However, the treatments were weak since trees already had received some N and Ca applications at their standard rates.

Prior to Phase II, we decided to stay with the same trees and treatments in Orchard 1 in Peru because tree nutrition is cumulative. We picked up another orchard in Peru and two more in Ecuador and began treatments at the beginning of the following season in all orchards for Phase II. In all of these three new orchards, the growers were applying much higher N and much lower Ca than Orchard 1 in Peru and were not spraying Ca early during fruit development, which was similar to what most growers do in most countries. Also, managers of the other three orchards told us that they had seen *corte negro* in their orchards which was the opposite of Orchard 1 in Peru.

Therefore, in the other three orchards, we imposed treatments to reduce N and increase Ca (especially by foliar applications early during fruit development which was not standard practice) with the idea that they would see *corte negro* in the control treatment but maybe not in one or more of the other three treatments (**Tables 2 through 6**).

Table 2. Fertilization information for Orchard 1, Ecuador ('Tommy Atkins')

Total of Nitrogen and Calcium per tree per year

Treatments	Total Nitrogen	Total Calcium
T1: High N, Medium Ca (standard grower practice)	427.3 g N/tree	50.4 g Ca/tree
T2: Higher N, Low Ca (increased N, stopped Ca)	662.1 g N/tree	**No application**
T3: Low N, Medium Ca (stopped N)	**No application**	25.9 g Ca/tree
T4: High N, High Ca (increased Ca)	427.3 g N/tree	67.7 g Ca/tree

Nitrogen and Calcium application per tree per year

Treatments	Soil Nitrogen Application	Foliar Nitrogen Application	Soil Calcium Application	Foliar Calcium Application
T1: High N, Medium Ca (standard grower practice)	1. Urea (69 g N/tree) applied **two** times 2. Urea (138 g N/tree) applied **one** time 3. Mono ammonium phosphate (40.8 g N/tree) applied **one** time 4. Calcium nitrate (10.3 g N/tree) applied **four** times	1. Potassium nitrate (17.3 g N/tree) applied **one** time 1. Potassium nitrate (13 g N/tree) applied four times	1. Calcium Nitrate (12.6 g Ca/tree) applied **four** times	**No Calcium application**
T2: Higher N, Low Ca (increased N, stopped ca)	1. Urea (69 g N/tree) applied **two** times 2. Urea (138 g N/tree) applied **three** times	1. Potassium nitrate (17.3 g N/tree)- applied **one** time 1. Potassium nitrate (13 g	**No Calcium application**	**No Calcium application**

	3. Mono ammonium phosphate (40.8 g N/tree) applied **one** time	N/tree) applied four times		
T3: Low N, Medium Ca (stopped N)	**No Nitrogen application**	**No Nitrogen application**	**No Calcium application**	1. Di-calcium Phosphate (4.32 g Ca/tree) applied **six** times
T4: High N, High Ca (increased Ca)	1. Urea (69 g N/tree) applied **two** times 2. Urea (138 g N/tree) applied **one** time 3. Mono ammonium phosphate (40.8 g N/tree) applied **one** time 4. Calcium nitrate (10.3 g N/tree) applied **four** times	1. Potassium nitrate (17.3 g N/tree)-applied **one** time 1. Potassium nitrate (13 g N/tree) applied four times	1. Calcium Nitrate (12.6 g Ca/tree) applied **four** times	1. Di-calcium Phosphate (4.32 g Ca/tree) applied **four** times

Table 3. Fertilization information for Orchard 2, Ecuador ('Ataulfo')

Total of Nitrogen and Calcium per tree per year

Treatments	Total Nitrogen	Total Calcium
T1: High N, Medium Ca (standard grower practice)	109.7 g N/tree	195.2 g Ca/tree
T2: Higher N, Low Ca (increased N, Stopped Ca)	335.1 g N/tree	**No application**
T3: Low N, Medium Ca (stopped N)	**No application**	134.6 g Ca/tree
T4: High N, High Ca (increased Ca)	109.7 g N/tree	212.5 g Ca/tree

Nitrogen and Calcium application per tree per year

Treatments	Soil Nitrogen Application*	Foliar Nitrogen Application	Soil Calcium Application*	Foliar Calcium Application
T1: High N, Medium Ca (standard grower practice)	1. DAP (28.8 g N/tree) applied **one** time 2. Calcium Nitrate (25.3 g N/tree) applied **two** times	1. Potassium nitrate (17.3 g N/tree)- applied **one** time 2. Potassium nitrate (13 g N/tree)- applied once	1. Calcium Nitrate (34.6 g Ca/tree) applied **two** times 2. Green Cabor (126 g Ca/tree) applied **one** time	**No Calcium application**
T2: Higher N, Low Ca (increased N, Stopped Ca)	1. Urea (138 g N/tree) **two** times 2. DAP (28.8 g N/tree) applied once	1. Potassium nitrate (17.3 g N/tree)- applied **one** time 2. Potassium nitrate (13 g N/tree)- applied once	**No Calcium application**	**No Calcium application**
T3: Low N, Medium Ca (stopped N)	**No Nitrogen application**	**No Nitrogen application**	1. Green Cabor (126 g Ca/tree) applied **one** time	1. Di-calcium Phosphate (4.32 g Ca/tree) applied **two** times

T4: High N, High Ca (increased Ca)	1. DAP (28.8 g N/tree) applied **one** time 2. Calcium Nitrate (25.3 g N/tree) applied **two** times	1. Potassium nitrate (17.3 g N/tree)- applied **one** time 2. Potassium nitrate (13 g N/tree)- applied once	1. Calcium Nitrate (34.6 g Ca/tree) applied **two** times 2. Green Cabor (126 g Ca/tree) applied **one** time	1. Di-calcium Phosphate (4.32 g Ca/tree) applied **four** times

***The products Bufalo (2 applications of 8 g/tree, 2 applications of 10 g/tree) and Biomax (1 application of 5 g/tree) were added to the soil for each treatment. These products contain small amounts of N and/or Ca but the label did not indicate the concentrations of these elements.

Table 4. Fertilization information for Orchard 1, Peru ('Kent')

Total of Nitrogen and Calcium per tree per year

Treatments	Total Nitrogen	Total Calcium
T1: Low N, High Ca (standard grower practice)	105.1 g N/tree	4.68 g Ca/tree
T2: Low N, Low Ca (stopped Ca applications)	105.1 g N/tree	No application
T3: High N, High Ca increased Ca)	140.04 g N/tree	4.68 g Ca/tree
T4: High N, Low Ca (stopped Ca applications)	140.04 g N/tree	No application

Nitrogen and Calcium application per tree per year

Treatments	Soil Nitrogen Application	Foliar Nitrogen application	Soil Calcium Application	Foliar Calcium Application
T1: Low N, High Ca (standard grower practice)	1. Ammonium Nitrate (52.8 g N/tree)	1. Potassium nitrate (8.71 g N/tree)-applied **six** times	No application	1. Max Flow (1.17 g Ca/tree) applied **four** times
T2: Low N, Low Ca (stopped ca applications)	1. Ammonium Nitrate (52.8 g N/tree)	1. Potassium nitrate (8.71 g N/tree)-applied **six** times	No application	No application
T3: High N, High Ca	1. Ammonium Nitrate (52.8 g N/tree) 2. Ammonium Nitrate (34.98 g N/tree)	1. Potassium nitrate (8.71 g N/tree)-applied **six** times	No application	1. Max Flow (1.17 g Ca/tree) applied **four** times
T4: High N, Low Ca (stopped Ca application)	1. Ammonium Nitrate (52.8 g N/tree) 2. Ammonium Nitrate (34.98 g N/tree)	1. Potassium nitrate (8.71 g N/tree)-applied **six** times	No application	No application

Table 5. Fertilization information for Orchard 2, Peru ('Kent')

Total of Nitrogen and Calcium per tree per year

Treatments	Total Nitrogen	Total Calcium
T1: High N, Low foliar Ca (standard grower practice)	126.3 g N/tree	895.1 g Ca/tree
T2: Higher N, Low foliar Ca Spray (increased N)	456.3 g N/tree	895.1 g Ca/tree
T3: Low N, High Ca (decreased N and increased Ca)	62.4 g N/tree	903.7 g Ca/tree
T4: High N, High Ca (increased Ca)	126.3 g N/tree	903.7 g Ca/tree
T5: Low N, Low Ca (stopped N application)	62.4 g N/tree	895.1 g Ca/tree

Note: All Ca treatments received gypsum applied to the soil. So, the only difference was in the amount of foliar Ca applied

Nitrogen and Calcium application per tree per year

Treatments	Soil Nitrogen Application	Foliar Nitrogen application	Soil Calcium Application	Foliar Calcium Application
T1: High N, Low Ca (standard grower practice)	1. BIG N (60.1 g N/tree) 2. Compost (3.8 g of N/tree)	1. Potassium nitrate (20.8 g N/tree) applied **three** times	1. Calcium sulfate dehydrate gypsum (882 g Ca/tree) 2. Compost (2.48 g of Ca/tree)	1. CALPLANT (2 g Ca/tree) applied **three** times 2. Maxflow (2.3 g Ca/tree) applied **two** times
T2: Higher N, Low Ca (increased N)	1. BIG N (60.1 g N/tree) 2. Ammonium Nitrate (330 g N/tree) 3. Compost (3.8 g of N/tree)	1. Potassium nitrate (20.8 g N/tree) applied **three** times	1. Calcium sulfate dehydrate gypsum (882 g Ca/tree) 2. Compost (2.48 g of Ca/tree)	1. CALPLANT (2 g Ca/tree) applied **three** times 2. Maxflow (2.3 g Ca/tree) applied **two** times
T3: Low N, High Ca (decreased N and increased	**No application**	1. Potassium nitrate (20.8 g N/tree) applied **three** times	1. Calcium sulfate dehydrate gypsum (882 g	1. CALPLANT (2 g Ca/tree) applied **five** times

Ca)			Ca/tree) 2. Compost (2.48 g of Ca/tree)	2. Maxflow (2.3 g Ca/tree) applied **four** times
T4: High N, High Ca (increased Ca)	1. BIG N (60.1 g N/tree) 2. Compost (3.8 g of N/tree)	1. Potassium nitrate (20.8 g N/tree) applied **three** times	1. Calcium sulfate dehydrate gypsum (882 g Ca/tree) 2. Compost (2.48 g of Ca/tree)	1. CALPLANT (2 g Ca/tree) applied **five** times 2. Maxflow (2.3 g Ca/tree) applied **four** times
T5: Low N, Low Ca (stopped N application)	**No application**	1. Potassium nitrate (20.8 g N/tree) applied **three** times	1. Calcium sulfate dehydrate gypsum (882 g Ca/tree) 2. Compost (2.48 g of Ca/tree)	1. CALPLANT (2 g Ca/tree) applied **three** times 2. Maxflow (2.3 g Ca/tree) applied **two** times

In summary, prior to starting the project, we assumed that our only option would be to prevent *corte negro* by treatments that decreased N and/or increased Ca since most growers everywhere typically use very high N rates and don't spray the fruit with Ca early in development. However, the unusual practice of Orchard 1 in Peru and the fact that they promised us that they never had *corte negro*, provided an opportunity to try to cause the disorder. We appreciate that they allowed us to apply treatments to cause a disorder in their orchard where they never had the problem before.

At the end of this project, the soil nutrient measurements highlighted the situation that it clearly takes multiple seasons to overcome the history of fertilizer usage at mango farms such as those we used in order to establish and see results from a new fertilizer program. Overall, the treatments with altered application amounts of N and Ca did not significantly change the amounts or the ratios of N and Ca in the soil, leaves or fruit (**see Appendix, Tables 1 through 113**). Levels of P and K and microelements were similarly not affected. After our analysis of the data, since we were not able to show that we changed the N and

Ca status of the test trees and fruit, we were unsuccessful in proving our hypothesis that mango fruit become predisposed to develop *corte negro* symptoms at some critical period of fruit development due to low Ca and/or high N, which would have been possible only if we had shown that the Ca:N ratio was changed.

Objective 4 – Postharvest Experiments. There was a small incidence of *corte negro* observed in the fruit from the four, on-farm trials, but it was not associated with any of the fertilizer treatments (**see Appendix, Tables 114 through 126**). The most significant finding was that *corte negro* was usually observed only in fruit from treatments that included refrigerated storage (at around 10 °C). In the 2016-17 season, we adjusted fruit harvest maturity so that the mangos were harvested earlier than in previous seasons, around maturity Stage 2, which is more sensitive to chilling injury than later stages. However, this did not alter the results.

Interestingly, we were able to investigate an incident of *corte negro* that occurred in 'Ataulfo' mangos shipped to the USA in 2016, in which a container held fruit from two different lots, one of which developed about 40% incidence of *corte negro* while the other lot had no damage. We were able to determine that the fruit from both lots came from the same farm but had been harvested 2 days apart. Both lots were apparently similar in maturity at harvest (almost all Stage 2), but the later harvested lot had not been as thoroughly cooled as the earlier harvested lot. Consequently, the first lot of fruit experienced lower temperatures during transit (a stable 9-10^{o}C was recorded) and developed *corte negro*, while fruit in the other lot warmed slightly during transit (from 11-12^{o} to 13-14^{o}C) and did not develop *corte negro*. Of note is that the accepted threshold temperature for postharvest chilling damage of 'Ataulfo' mangos is 12.5^{o}C. This suggests that chilling injury was involved in the development of *corte negro*.

However, when we compared early, middle, and late season harvested fruit from the same farm in the next season (2017), representing stage 1, 2, and 3 maturity, respectively, *corte negro* incidence was high, but there was no significant difference between the harvests (**see Appendix, Tables 127 through 129**). Heavy rains in Peru caused loss of power and cut short the storage of fruit from the third harvest, but we do not think this significantly affected the results. Since less mature mango fruit are known to be more susceptible to chilling injury, the results of this experiment do not clearly support a role for chilling injury in

development of *corte negro*, despite other evidence that it does.

Note: In an unrelated project in 2015, funded by the NMB, we conducted 3-week duration shipping plus storage trials between Mexico and Florida, with or without modified atmosphere packaging (MAP). A shipment of 'Ataulfo' mangos developed *corte negro* upon ripening in Florida. While the incidence of *corte negro* was severe in in the non-MAP control fruit, *corte negro* was almost absent from the MAP fruit.

Overall Conclusions

- We were not able to confirm our hypothesis that mangos become predisposed to develop *corte negro* symptoms at some critical period of fruit development due to low Ca and/or high N.
  - It clearly takes multiple seasons to overcome the history of fertilizer usage at farms in order to establish new pre-harvest conditions.
  - There also appears to be a climate effect, as suggested by the season-to-season variability in *corte negro* incidence.

- However, the evidence does point toward confirmation of our hypothesis that *corte negro* symptom development is triggered by postharvest cold stress (*i.e.*, it is a kind of chilling injury).

Recommendations

- **Reduce N and/or increase Ca fertilizer application rates**
  - Many growers could probably significantly cut N (25-50%) and increase Ca rates
  - *This may yield long-term benefits in reducing corte negro, without harming productivity*
  - Reduce (especially soil) N applications on a small sample of trees for 2-5 years
    - N is already being applied foliarly in nutrient sprays and to induce bloom after paclobutrazol or uniconazole applications
  - Calcium borate sprays preferred; use gypsum (not lime) if

applying Ca to soil to avoid increasing soil pH

- **Avoid chilling injury**
  - Harvest mature fruit (also, paclobutrazol may prolong fruit juvenility)
  - **Do not expose mangos to temperatures below 10-12.5°C**, depending on variety ('Ataulfo'/'Honey' is the most sensitive)
    - Specify marine container fresh-air exchange (FAE) of not less than 45 CFM (= 76 CMH)
    - Try to book shipments with the shortest transit periods possible

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  - Eng. Johanna Ramirez Mogollón, Project Manager

- Cooperating Growers and Packinghouses

Appendix

Table 1. Pre-harvest Soil-Trench Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-First Year of Data Collection (June 24, 2014)

Pre-harvest Treatments[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	7.8a[z]	30.0a	31.8a	235a	2910a	237b	7.8a	30.5a	4.7a	14.2a	4.9a	0.58a	100a
T2: Standard N, Low Ca	7.6a	31.6a	37.4a	255a	2753a	247b	6.2a	21.2a	5.4a	19.2a	4.9a	0.52a	89a
T3: Low N, Standard Ca	7.7a	31.6a	48.2a	246a	2922a	358a	8.2a	20.5a	5.8a	19.2a	7.9a	0.56a	94a
T4: Standard N, High Ca	7.7a	33.0a	34.4a	237a	2919a	268b	9.0a	17.9a	6.3a	18.4a	4.3a	0.46a	90a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 2. Pre-harvest Soil-Row Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-First Year of Data Collection (June 24, 2014)

Pre-harvest Treatments[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	7.9a[z]	28.6a	43.4a	229a	3253a	167a	10.0a	30.8a	13.3a	12.0a	3.4a	0.68a	119a
T2: Standard N, Low Ca	7.7a	31.0a	49.0a	239a	2953b	185b	7.5a	30.4a	12.6a	15.2a	2.8a	0.70a	97a
T3: Low N, Standard Ca	7.8a	28.8a	49.6a	352a	3103ab	246a	8.8a	35.1a	14.1a	12.8a	3.8a	0.66a	110a
T4: Standard N, High Ca	7.7a	30.8a	45.8a	228a	3245a	206ab	13.8a	27.9a	12.3a	17.2a	3.2a	0.68a	108a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 3. Post-harvest Soil-Trench Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-First Year of Data Collection (January 13, 2015)

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	7.8a[z]	35.4a	28.8a	258a	3480a	283b	9.4a	7.3b	4.4a	13.4a	7.2a	1.12a	99a
T2: Standard N, Low Ca	7.8a	26.0a	20.6a	202a	3635a	306b	16.2a	25.1a	6.6a	17.2a	7.8a	1.06a	153a
T3: Low N, Standard Ca	7.7a	30.0a	23.0a	270a	3599a	426a	17.2a	17.7ab	6.7a	18.2a	7.0a	1.07a	129a
T4: Standard N, High Ca	7.8a	28.8a	29.8a	245a	3792a	303b	14.4a	11.5ab	5.3a	16.2a	6.2a	1.24a	136a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 4. Post-harvest Soil-Row Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-First Year of Data Collection (January 13, 2015)

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	7.9a[z]	31.2a	25.4ab	221a	3891a	182b	29.2a	34.3a	16.2a	13.8a	8.2a	1.4ab	127a
T2: Standard N, Low Ca	7.6b	25.2a	36.8a	204a	3839a	241a	18.8a	41.5a	19.0a	15.0a	10.4a	2.3a	157a
T3: Low N, Standard Ca	7.7ab	26.4a	15.4b	239a	3790a	276a	19.0a	73.4a	21.4a	17.4a	8.0a	1.0b	150a
T4: Standard N, High Ca	7.7ab	28.8a	28.8ab	224a	3798a	256a	26.4a	54.0a	21.6a	17.4a	7.6a	1.1b	134a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 5. Pre-harvest Foliar Analysis – Orchard 1, Ecuador, 'Tommy Atkins' - First Year of Data Collection (June 24, 2014)

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.4a[z]	0.11a	0.90a	2.93a	0.17ab	0.11a	19.6a	10.4a	49.0ab	41.0a	37.6a	2.1a
T2: Standard N, Low Ca	1.3a	0.10a	0.96a	2.92a	0.14b	0.11a	23.8a	10.6a	58.8a	35.0a	41.2a	2.2a
T3: Low N, Standard Ca	1.4a	0.15a	1.04a	2.58a	0.17ab	0.11a	22.0a	10.8a	56.6ab	35.2a	41.8a	1.9a
T4: Standard N, High Ca	1.4a	0.13a	0.92a	3.20a	0.18a	0.11a	28.4a	10.2a	45.2b	34.6a	43.6a	2.3a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 6. Post-harvest Foliar Analysis – Orchard 1, Ecuador, 'Tommy Atkins' - First Year of Data Collection (January 06, 2015)

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.2a[z]	0.08a	0.80a	4.6a	0.14ab	0.08a	12.4a	153.6a	134.8a	65.8a	75.4a	3.9a
T2: Standard N, Low Ca	1.3a	0.09a	0.80a	4.2a	0.10b	0.09a	11.0a	188.0a	120.2a	62.6a	79.6a	3.3a
T3: Low N, Standard Ca	1.2a	0.12a	0.99a	4.1a	0.15ab	0.06a	8.4a	152.2a	132.0a	64.4a	69.0a	3.6a
T4: Standard N, High Ca	1.2a	0.11a	0.83a	4.4a	0.16a	0.09a	13.4a	103.2a	128.8a	62.0a	68.4a	3.9a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 7. First Fruit Analysis (average diameter fruit= 0.51 cm) Orchard 1, Ecuador, 'Tommy Atkins' - First Year of Data Collection

(September 09, 2014)

Pre-harvest Treatment	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	2.3a[z]	0.30a	1.91a	0.53a	1.56a	0.18a	26.2a	24.8a	51.2a	15.4a	17.0a	0.23a
T2: Standard N, Low Ca	2.3a	0.32a	1.79a	0.48a	0.15a	0.17a	24.4ab	23.4a	46.2a	14.0a	16.8a	0.21a
T3: Low N, Standard Ca	2.1a	0.33a	1.78a	0.50a	2.71a	0.17a	21.0ab	21.8a	66.4a	14.8a	16.6a	0.24a
T4: Standard N, High Ca	2.1a	0.29a	1.84a	0.56a	0.16a	0.18a	20.6b	22.2a	41.4a	13.4a	17.8a	0.26a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 8. Second Fruit Analysis (average diameter fruit= 1.74 cm) Orchard 1, Ecuador, 'Tommy Atkins' - First Year of Data Collection

(September 29, 2014)

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	1.9a[z]	0.23a	2.03a	0.29a	0.13a	0.13ab	17.8a	18.0a	29.8a	3.4a	21.0a	0.15a
T2: Standard N, Low Ca	2.1a	0.26a	2.19a	0.29a	0.14a	0.15a	21.0a	18.2a	32.6a	3.8a	16.0a	0.14a
T3: Low N, Standard Ca	2.0a	0.24a	1.69a	0.23a	0.12a	0.12b	18.8a	24.2a	59.2a	3.6a	17.4a	0.11a
T4: Standard N, High Ca	2.0a	0.24a	2.02a	0.26a	0.13a	0.14ab	16.2a	15.6a	28.6a	5.0a	19.8a	0.13a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 9. Third Fruit Analysis (average diameter fruit= 3.28 cm) Orchard 1, Ecuador, 'Tommy Atkins' – First Year of Data Collection (October 20, 2014)

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	1.1b[z]	0.17a	1.70a	0.26a	0.10a	0.10a	13.0a	18.4a	21.0a	4.4a	13.8a	0.23a
T2: Standard N, Low Ca	1.5a	0.20a	1.95a	0.28a	0.12a	0.11a	25.6a	24.4a	21.2a	3.8a	19.6a	0.19a
T3: Low N, Standard Ca	1.2ab	0.21a	1.97a	0.26a	0.11a	0.10a	15.0a	18.6a	22.4a	4.0a	17.0a	0.21a
T4: Standard N, High Ca	1.2ab	0.18a	1.70a	0.23a	0.10a	0.10a	11.2a	16.4a	17.4a	5.0a	14.6a	0.19a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 10. Fourth Fruit Analysis (average diameter fruit= 5.69 cm) Orchard 1, Ecuador, 'Tommy Atkins' – First Year of Data Collection (November 11, 2014)

Pre-harvest Treatments[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	0.68a[z]	0.12a	1.43a	0.24b	0.09a	0.07a	6.6a	8.8a	58.6a	4.2a	9.4a	0.35b
T2: Standard N, Low Ca	0.72a	0.11a	1.41a	0.24ab	0.09a	0.07a	7.6a	9.4a	42.6a	7.2a	8.6a	0.34b
T3: Low N, Standard Ca	0.72a	0.15a	1.62a	0.23b	0.08a	0.07a	6.2a	8.8a	55.0a	4.0a	8.8a	0.32b
T4: Standard N, High Ca	0.68a	0.12a	1.51a	0.31a	0.10a	0.06a	7.0a	9.0a	59.6a	4.6a	7.6a	0.45a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 11. Fifth Fruit Analysis (average diameter fruit= 7.54 cm) Orchard 1, Ecuador, 'Tommy Atkins' – First Year of Data Collection (December 03, 2014)

Pre-harvest Treatments[y]	N	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (%)	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{\mu g}{cm^3}\right)$
T1: Control (Standard N, Standard Ca)	0.50ab[z]	0.09a	1.08a	0.16a	0.07a	0.05a	3.6a	7.8a	24.8a	2.0b	10.2a	0.34a
T2: Standard N, Low Ca	0.48b	0.09a	1.05a	0.18a	0.06a	0.05a	3.8a	8.0a	28.0a	2.6ab	9.2a	0.38a
T3: Low N, Standard Ca	0.54ab	0.10a	1.25a	0.18a	0.07a	0.05a	5.0a	9.2a	42.4a	3.6a	9.2a	0.34a
T4: Standard N, High Ca	0.64a	0.10a	1.21a	0.19a	0.07a	0.05a	3.8a	8.4a	27.4a	2.6ab	10.2a	0.30a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 12. Pre-harvest Soil-Trench Analysis – Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (June 16, 2014).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	6.2a[z]	21.0a	43.6a	280a	1397a	190a	9.0a	3.2a	4.0a	186a	22a	0.33b	65.8a
T2: Standard N, Low Ca	6.3a	20.2a	36.2a	303a	1487a	246a	8.6a	3.8a	4.2a	165a	18a	0.50a	72.0a
T3: Low N, Standard Ca	5.9a	22.8a	40.6a	346a	1655a	298a	10.8a	4.2a	6.0a	186a	26a	0.45ab	76.4a
T4: Standard N, High Ca	5.9a	22.8a	37.8a	297a	1440a	238a	10.8a	3.6a	4.6a	176a	26a	0.32b	64.2a

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 13. Pre-harvest Soil-Row Analysis – Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (June 16, 2014).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	6.34a[z]	25.0a	96.8a	314a	1655a	251a	6.2a	7.0a	10.4a	213a	21a	0.50a	65.0a
T2: Standard N, Low Ca	6.3a	19.2a	96.2a	316a	1707a	275a	7.4a	8.0a	11.2a	210a	22a	0.58a	90.6a
T3: Low N, Standard Ca	6.2a	26.6a	84.0a	372a	1985a	350a	8.6a	7.8a	10.6a	168a	21a	0.48a	75.6a
T4: Standard N, High Ca	6.2a	22.4a	94.2a	362a	1779a	262a	8.4a	7.8a	10.8a	185a	23a	0.51a	82.3a

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 14. Post-harvest Soil-Trench Analysis-Orchard 2, Ecuador, 'Ataulfo'-First Year of Data Collection (February 03, 2015).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	6.3a[z]	31.0a	44.2a	311a	1998a	225a	12.6a	4.0a	3.9a	215a	11ab	0.50a	61.0a
T2: Standard N, Low Ca	6.3a	24.6a	31.8a	273a	2045a	301a	11.2a	3.7a	3.0a	159a	8a	0.42a	81.7a
T3: Low N, Standard Ca	5.8a	32.8a	30.8a	340a	1870a	300a	12.2a	3.6a	3.8a	158a	12ab	0.35a	57.4a
T4: Standard N, High Ca	6.0a	27.0a	33.8a	282a	1585a	306a	12.2a	3.3a	4.2a	193a	14.2a	0.40a	61.2a

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 15. Post-harvest Soil-Row Analysis-Orchard 2, Ecuador, 'Ataulfo'-First Year of Data Collection (February 03, 2015).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	6.3a[z]	31.0ab	101.4a	308ab	2394a	282a	27.4a	7.9a	9.1a	283a	10a	0.46a	76.5a
T2: Standard N, Low Ca	5.9a	26.6b	95.2a	285b	1824a	251a	27.8a	9.0a	10.9a	212ab	12a	0.41a	68.4a
T3: Low N, Standard Ca	6.0a	35.8a	78.0a	383a	2320a	304a	50.6a	6.0a	49.4a	153b	9.6a	0.55a	65.1a
T4: Standard N, High Ca	6.2a	24.0b	78.0a	305b	2157a	297a	32.6a	6.6a	11.9a	215ab	11.6a	0.26a	91.2a

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 16. Pre-harvest Foliar Analysis – Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (June 16, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.9a[z]	0.094a	1.09a	2.4a	0.21a	0.16a	18.0ab	6.6a	63.2a	565a	33.2a	1.3a
T2: Standard N, Low Ca	1.6a	0.094a	1.08a	3.0a	0.22a	0.17a	19.4a	7.0a	72.2a	535a	23.0a	1.9a
T3: Low N, Standard Ca	1.7a	0.096a	1.07a	2.3a	0.20a	0.15a	16.8b	7.2a	62.8a	510a	28.8a	1.4a
T4: Standard N, High Ca	1.7a	0.098a	1.13a	2.5a	0.25a	0.17a	17.0b	6.4a	68.6a	505a	30.0a	1.5a

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 17. Post-harvest Foliar Analysis-Orchard 2, Ecuador, 'Ataulfo'-First Year of Data Collection (December 19, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.6a[z]	0.110a	0.81b	2.6a	0.12b	0.12b	11.0a	7.2b	119b	703a	76.8a	1.6a
T2: Standard N, Low Ca	1.6a	0.112a	0.89ab	2.7a	0.14ab	0.15ab	14.6a	8.6ab	166a	684a	79.0a	1.7a
T3: Low N, Standard Ca	1.6a	0.118a	0.95a	2.9a	0.16a	0.17a	16.6a	10.2a	153ab	726a	80.6a	1.8a
T4: Standard N, High Ca	1.6a	0.118a	0.99a	2.9a	0.14ab	0.13ab	12.4a	9.0ab	153ab	833a	83.0a	1.9a

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 18. First Fruit Analysis (ave. diameter fruit= 0.51 cm) Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (August 19, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	2.0a[z]	0.23a	1.50a	1.16a	0.21a	0.126ab	26.0a	21.6a	91ab	131a	25.8ab	0.6a
T2: Standard N, Low Ca	2.0a	0.23a	1.64a	0.92a	0.23a	0.132a	26.0a	21.6a	122a	146a	23.0b	0.5a
T3: Low N, Standard Ca	2.0a	0.23a	1.56a	0.58a	0.21a	0.112b	24.6a	20.0a	62b	153a	27.2a	0.3a
T4: Standard N, High Ca	1.9a	0.24a	1.57a	0.62a	0.21a	0.128ab	23.8a	15.8a	58b	100a	25.2ab	0.5a

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 19. Second Fruit Analysis (ave. diameter fruit= 1.80 cm) Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (September 09, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	1.2a[z]	0.17a	1.4a	0.45a	0.14a	0.10a	23.2a	32.0a	68a	59a	10.2a	0.4a
T2: Standard N, Low Ca	1.3a	0.16a	1.5a	0.46a	0.14a	0.11a	20.0a	25.2a	45b	64a	10.0a	0.4a
T3: Low N, Standard Ca	1.3a	0.14a	1.53a	0.42a	0.14a	0.10a	19.6a	23.8a	57ab	68a	10.6a	0.3a
T4: Standard N, High Ca	1.2a	0.16a	1.51a	0.40a	0.14a	0.11a	18.8a	26.6a	45b	62a	11.0a	0.3a

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 20. Third Fruit Analysis (ave. diameter fruit= 2.99 cm) Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (September 29, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	0.85a[z]	0.08a	1.12a	0.17a	0.07a	0.42a	12.2b	14.8a	70a	28a	12.2a	0.2a
T2: Standard N, Low Ca	0.77a	0.08a	1.16a	0.20a	0.09a	0.040ab	13.8ab	19.0a	160a	26a	11.4a	0.3a
T3: Low N, Standard Ca	0.75a	0.08a	1.02a	0.16a	0.20a	0.032b	11.2b	16.8a	352a	32a	11.2a	0.2a
T4: Standard N, High Ca	0.60a	0.08a	1.00a	0.18a	0.08a	0.032b	16.8a	13.4a	120a	36a	12.2a	0.2a

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 21. Fourth Fruit Analysis (ave. diameter fruit= 3.77 cm) Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (October 20, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	0.80b[z]	0.07a	1.38a	0.15a	0.07a	0.05a	16.2a	9.6a	29a	19a	21.0a	0.2a
T2: Standard N, Low Ca	0.92ab	0.09a	1.49a	0.16a	0.08a	0.05a	11.0a	13.0a	35a	15a	20.4a	0.2a
T3: Low N, Standard Ca	1.00a	0.08a	1.40a	0.11a	0.07a	0.05a	17.8a	12.6a	21a	17a	19.4a	0.1a
T4: Standard N, High Ca	0.85ab	0.09a	1.88a	0.26a	0.14a	0.08a	21.4a	28.0a	60a	50a	19.4a	0.3a

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 22. Fifth Fruit Analysis (ave. diameter fruit= 4.57 cm) Orchard 2, Ecuador, 'Ataulfo' – First Year of Data Collection (November 07, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
T1: Control (Standard N, Standard Ca)	0.72a[z]	0.09a	1.02a	0.10a	0.06a	0.04a	5.8a	7.6a	27a	12a	10.2a	0.1a
T2: Standard N, Low Ca	0.76a	0.09a	1.14a	0.12a	0.06a	0.04a	6.0a	7.6a	32a	10a	11.2a	0.2a
T3: Low N, Standard Ca	0.74a	0.09a	1.17a	0.10a	0.06a	0.04a	5.8a	7.2a	27a	9a	10.2a	0.1a
T4: Standard N, High Ca	0.72a	0.08a	1.07a	0.10a	0.06a	0.03a	5.6a	7.2a	23a	11a	8.8a	0.1a

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 23. Pre-harvest Soil-Trench Analysis-Orchard 1, Peru, 'Kent'-Second Year of Data Collection (April 16, 2014).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.6a[z]	2.8a	197ab	0.19a	3.0b	1.04b	23.4a	22.9a	32.1a	27.8ab	8.1a	1.23b	1.10a
T2: Standard N, Low Ca	6.7a	2.4a	191ab	0.16a	3.4ab	1.14b	25.8a	16.8a	23.0a	22.8b	7.0a	1.36b	1.44a
T3: Low N, Standard Ca	7.4a	2.4a	167b	0.21a	4.1a	1.43a	21.2a	24.3a	32.2a	59.8a	9.8a	1.05b	1.83a
T4: Standard N, High Ca	7.8a	2.4a	262a	0.19a	4.1a	1.18b	25.6a	17.3a	23.4a	50.2ab	10.9a	1.74a	1.78a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 24. Pre-harvest Soil-Row Analysis - Orchard 1, Peru, 'Kent' – Second Year of Data Collection (April 16, 2014).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.7a[z]	2.4a	188a	0.4b	3.3a	1.26a	39.8ab	29.2a	26.2a	37.0a	6.7ab	1.58a	1.39a
T2: Standard N, Low Ca	7.9a	2.6a	186a	0.8a	2.2a	1.06b	50.8ab	18.1ab	5.7b	15.8a	4.4bc	5.31a	0.88a
T3: Low N, Standard Ca	7.8a	2.6a	189a	0.8a	2.6a	1.08ab	27.0b	3.5b	2.6b	13.0a	3.0c	1.28a	1.02a
T4: Standard N, High Ca	7.8a	2.6a	226a	0.6ab	3.0a	1.23ab	61.0a	18.7ab	11.6b	23.8a	8.6a	1.57a	1.24a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 25. Post-harvest Soil-Trench Analysis - Orchard 1, Peru, 'Kent' – Second Year of Data Collection (April 4, 2015).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.5b[z]	2.6a	219a	0.21a	4.1a	1.21a	17.8a	23.7a	11.8a	93.0a	8.9ab	0.96bc	1.63a
T2: Standard N, Low Ca	7.7b	2.6a	198a	0.20a	3.1b	0.85b	30.8a	8.04a	8.8a	19.2b	4.8b	1.49a	1.32a
T3: Low N, Standard Ca	7.4b	2.4a	157a	0.12b	3.4ab	1.09ab	17.6a	51.6a	20.0a	39.2b	11.6a	0.81c	1.52a
T4: Standard N, High Ca	8.1a	2.8a	206a	0.18ab	3.7ab	1.09ab	21.0a	20.3a	31.5a	30.8b	14.3a	1.20ab	1.26a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 26. Post-harvest Soil-Row Analysis – Orchard 1, Peru, 'Kent' – Second Year of Data Collection (April 4, 2015).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.8a[z]	6.0a	183ab	0.38a	3.9a	1.25a	38.0a	58.0a	12.3b	41.6a	11.7ab	1.63a	1.08a
T2: Standard N, Low Ca	7.4b	7.6a	164ab	0.51a	3.3a	1.12a	51.6a	44.1ab	48.9a	29.6a	15.8a	1.69a	0.95a
T3: Low N, Standard Ca	7.4b	3.0a	156b	0.32a	3.1a	1.26a	29.6a	6.7b	6.8b	42.4a	8.1b	1.20a	1.04a
T4: Standard N, High Ca	7.5b	3.6a	199a	0.47a	3.0a	1.20a	61.4a	19.3ab	12.3b	24.2a	9.2b	1.67a	0.85a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 27. Pre-harvest Foliar Analysis – Orchard 1, Peru, 'Kent' – Second Year of Data Collection (March 3, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.86b[z]	0.15a	0.78a	2.22a	0.30a	0.232ab	23.6a	6.22ab	271a	55.6a	150.4b	2.6ab
T2: Standard N, Low Ca	0.89b	0.14ab	0.66a	2.30a	0.31a	0.228b	20.6a	5.24b	145a	45.6a	159.0a	2.6ab
T3: Low N, Standard Ca	0.79b	0.11b	0.66a	2.30a	0.31a	0.230b	22.4a	6.98a	267a	44.0a	150.8b	2.9a
T4: Standard N, High Ca	1.0a	0.12b	0.73a	2.50a	0.30a	0.252a	22.2a	6.70a	241a	41.0a	161.0a	2.4b

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 28. Post-harvest Foliar Analysis – Orchard 1, Peru, 'Kent' – Second Year of Data Collection (April 4, 2015).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.10a[z]	0.116ab	0.86ab	2.4a	0.24a	0.13a	28.4a	7.5a	185a	40.6a	150a	2.2a
T2: Standard N, Low Ca	1.09a	0.112ab	1.00a	2.0a	0.25a	0.14a	26.6a	7.4a	137a	37.6a	144a	1.9a
T3: Low N, Standard Ca	1.02a	0.108b	0.78b	2.2a	0.27a	0.13a	25.8a	10.4a	148a	45.2a	158a	2.1a
T4: Standard N, High Ca	1.01a	0.122a	0.85ab	2.3a	0.25a	0.14a	19.2b	7.0a	189a	25.2b	157a	2.3a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 29. First Fruit Analysis (average diameter fruit= 0.5 cm) Orchard 1, Peru, 'Kent' – Second Year of Data Collection (October 6, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.26ab[z]	0.06b	1.8a	0.44a	0.11a	0.19a	40.8a	10.2a	46.8a	35.2a	65.4a	0.35ab
T2: Standard N, Low Ca	no fruit available											
T3: High N, Standard Ca	1.15b	0.15a	1.7a	0.42a	1.11a	0.20a	42.4a	8.6a	44.2a	23.4a	65.2a	0.37a
T4: High N, Low Ca	1.30a	0.07b	1.7a	0.36a	0.11a	0.21a	21.6b	9.1a	53.4a	20.2a	60.6a	0.28b

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 30. Second Fruit Analysis (average diameter fruit= 2.8 cm) Orchard 1, Peru, 'Kent' – Second Year of Data Collection (October 22, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.71a[z]	0.08ab	1.40a	0.20a	0.05a	0.15a	28.8a	5.34a	100.2a	7.2a	68.0a	0.29a
T2: Standard N, Low Ca	no fruit available											
T3: High N, Standard Ca	0.63a	0.09a	1.39a	0.20a	0.06a	0.14a	22.8ab	5.42a	190.0a	6.8a	76.6a	0.33a
T4: High N, Low Ca	0.75a	0.06b	1.30a	0.26a	0.06a	0.16a	18.4b	4.70a	172.2a	5.4a	67.6a	0.35a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 31. Third Fruit Analysis (average diameter fruit= 5.4 cm) Orchard 1, Peru, 'Kent' – Second Year of Data Collection (November 6, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.37a[z]	0.09a	1.0b	0.28a	0.04a	0.17a	4.2a	5.7a	94.8a	5.8a	40.8b	0.8a
T2: Standard N, Low Ca	no fruit available											
T3: High N, Standard Ca	0.44a	0.10a	1.2ab	0.26a	0.03a	0.16a	6.0a	5.7a	51.4a	6.4a	54.4a	0.7a
T4: High N, Low Ca	0.54a	0.08a	1.4a	0.28a	0.03a	0.18a	5.4a	6.3a	132.5a	7.2a	51.6ab	0.5a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 32. Fourth Fruit Analysis (average diameter fruit= 7.1 cm) Orchard 1, Peru, 'Kent' – Second Year of Data Collection (December 5, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.17a[z]	0.10a	1.11a	0.19a	0.02a	0.20c	6.6a	5.5a	51.4a	3.6b	46.2a	1.39a
T2: Standard N, Low Ca	no fruit available											
T3: High N, Standard Ca	0.21a	0.08a	0.92a	0.20a	0.02a	0.22b	3.2b	5.1a	41.0a	11.0a	27.4b	1.02a
T4: High N, Low Ca	0.21a	0.08a	1.05a	0.17a	0.02a	0.23a	5.0ab	4.1a	33.8a	14.8a	33.4ab	0.85a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 33. Pre-harvest Soil-Trench Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection (April 16, 2014).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.5a[z]	6.5a	12.8b	0.40a	47.0ab	4.8b	34.3a	1.2b	2.8a	10.3a	6.4a	1.7a	15.7ab
T2: High N, Standard Ca	7.0a	2.8a	14.3ab	0.38a	50.7a	4.8b	33.0a	2.8ab	2.5a	10.3a	9.8a	2.0a	17.5ab
T3: Low N, High Ca	7.5a	4.6a	7.2b	0.38a	57.8a	4.9b	19.2a	1.4b	2.0a	5.4a	5.4a	1.6a	19.5a
T4: Standard N, High Ca	7.3a	5.3a	25.3a	0.39a	17.7b	5.4a	38.4a	6.9a	2.8a	13.3a	8.8a	1.7a	3.5b

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 34. Pre-harvest Soil-Row Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection (April 16, 2014).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	6.9b[z]	3.6ab	30.2a	1.1a	47a	5.3ab	50.3a	1.5a	2.5a	11.0a	13.3a	2.5b	15.5a
T2: High N, Standard Ca	7.2ab	2.4b	27.2a	0.9a	50a	5.2b	60.5a	2.0a	2.4a	5.2a	14.1a	3.0ab	21.2a
T3: Low N, High Ca	7.4a	2.3b	23.0a	1.0a	44a	5.1b	46.7a	0.9a	1.3a	3.0a	6.5a	3.2ab	19.5a
T4: Standard N, High Ca	7.2a	4.0a	28.0a	1.2a	30a	5.7a	64.3a	1.9a	2.3a	8.5a	16.0a	3.8a	11.0a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 35. Post-harvest Soil-Trench Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection (April 4, 2015).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.3a[z]	34.8a[y]	18.4a	0.8a	33.4a	5.1a	447a	3.7a	1.6a	14.8a	25.1b	2.6a	1.0b
T2: High N, Standard Ca	6.8a	45.8a	20.2a	1.2a	46.6a	5.1a	415a	7.6a	1.8a	17.2a	40.6a	3.0a	1.0b
T3: Low N, High Ca	7.4a	3.6b	14.8a	0.6a	32.3a	5.4a	402a	2.5a	1.6a	14.8a	19.8b	3.0a	10.0a
T4: Standard N, High Ca	7.4a	4.4b[y]	11.4a	1.1a	56.0a	4.8a	431a	3.3a	1.8a	9.6a	23.0b	3.4a	12.0a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.
[y] Possible incorrect application or recordation.

Table 36. Post-harvest Soil-Row Analysis - Orchard 2, Peru, 'Kent' – Second Year of Data Collection (April 4, 2015).

Pre-harvest Treatments	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Control (Standard N, Standard Ca)	7.2a[z]	16.0a[y]	25.2a	0.93ab	22.2b	5.3a	152a	2.1a	2.1a	17.4a	34.3a	3.5a	2.5bc
T2: High N, Standard Ca	7.2a	21.0a	27.8a	1.11a	27.6a	5.5a	197a	2.7a	2.4a	7.6a	29.0a	3.7a	1.4c
T3: Low N, High Ca	7.3a	9.4ab	20.4a	0.81b	26.7ab	5.5a	181a	1.4a	2.6a	12.0a	22.5a	3.4a	4.5ab
T4: Standard N, High Ca	7.4a	3.6b[y]	23.6a	0.87ab	24.6ab	5.3a	117a	2.0a	3.4a	18.0a	22.5a	3.5a	6.8a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.
[y] Possible incorrect application or recordation.

Table 37. Pre-harvest Foliar Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection (April 16, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.12b[z]	0.10ab	0.93a	4.2a	0.20a	0.16a	26.2a	7.04c	133.6a	56.6b	139a	3.8a
T2: High N, Standard Ca	1.16b	0.11a	0.95a	3.9a	0.23a	0.15a	31.8a	9.06b	255.4a	63.6ab	154a	3.4a
T3: Low N, High Ca	1.20b	0.09b	0.94a	3.9a	0.21a	0.16a	27.8a	7.96bc	172.6a	57.6b	153a	3.0a
T4: Standard N, High Ca	1.35a	0.11a	0.99a	3.6a	0.57a	0.16a	32.0a	11.2a	147.7a	85.8a	142a	2.9a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 38. Post-harvest Foliar Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection (April 4, 2015).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	1.40b[z]	0.10a	0.86a	3.53a	0.24ab	0.15a	23.6a	19.4a	194a	71.2a	113.8a	2.5a
T2: High N, Standard Ca	1.55ab	0.09a	0.10ab	3.77a	0.26a	0.13a	27.2a	28.2a	282a	98.8a	124.6a	2.5a
T3: Low N, High Ca	1.45b	0.09a	1.04a	3.53a	0.24ab	0.13a	21.0a	19.1a	191a	95.0a	114.4a	2.4a
T4: Standard N, High Ca	1.66a	0.10a	1.00ab	3.41a	0.22b	0.13a	21.6a	22.9a	229a	105.0a	123.8a	2.1a

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 39. First Fruit Analysis (ave. diameter fruit= 0.5 cm) Orchard 2, Peru, 'Kent' – Second Year of Data Collection (October 1, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.95b[z]	0.13a	1.71a	0.41a	0.10a	0.21b	30.8a	13.2a	41.0a	24.8a	61.0a	0.45a
T2: High N, Standard Ca	1.26a	0.08b	1.80a	0.32b	0.09a	0.22ab	32.0a	13.3a	39.0a	24.6a	57.4a	0.27b
T3: Low N, High Ca	1.22ab	0.14a	1.84a	0.29b	0.09a	0.24a	30.0a	13.9a	32.8a	23.6a	47.4b	0.24b
T4: Standard N, High Ca	1.22ab	0.10ab	1.72a	0.44a	0.10a	0.23ab	28.2a	12.8a	53.4a	21.0a	56.6ab	0.36ab

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 40. Second Fruit Analysis (ave. diameter fruit= 2.5 cm) Orchard 2, Peru, 'Kent' – Second Year of Data Collection (October 15, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.68b[z]	0.09bc	1.56a	0.25ab	0.06ab	0.17c	12.8b	8.3b	20.4a	9.4a	59.8a	0.37a
T2: High N, Standard Ca	0.78b	0.06c	1.56a	0.18c	0.05b	0.21b	14.4b	7.1b	29.8a	5.4b	35.0b	0.23c
T3: Low N, High Ca	1.02a	0.13a	1.47a	0.22bc	0.06ab	0.24a	16.0ab	11.6a	34.6a	4.2b	33.6b	0.22c
T4: Standard N, High Ca	0.93a	0.10b	1.52a	0.28a	0.07a	0.21b	19.0a	9.6ab	39.8a	6.0b	54.6a	0.30b

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 41. Third Fruit Analysis (ave. diameter fruit= 6.0 cm) Orchard 2, Peru, 'Kent' – Second Year of Data Collection (October 30, 2014).

Pre-harvest Treatments	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.37b[z]	0.09b	1.68a	0.24ab	0.04a	0.20c	19.0a	11.8a	150c	14.0a	92.8b	0.68a
T2: High N, Standard Ca	0.52a	0.11ab	1.84a	0.22b	0.04a	0.23ab	18.0a	10.6a	226b	16.4a	116.4a	0.44b
T3: Low N, High Ca	0.39b	0.13a	1.69a	0.24ab	0.03a	0.24a	18.0a	11.9a	288a	15.2a	117.6a	0.63a
T4: Standard N, High Ca	0.46ab	0.12ab	1.76a	0.30a	0.04a	0.22b	10.8b	12.9a	292a	19.0a	106.2a	0.66a

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 42. Fourth Fruit Analysis (ave. diameter fruit= 6.6 cm) Orchard 2, Peru, 'Kent' – Second Year of Data Collection (December 18, 2014).

Pre-harvest Treatment	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Control (Standard N, Standard Ca)	0.31c[z]	0.10ab	1.11a	0.19a	0.04b	0.23b	5.6a	9.2a	150a	5.2ab	37.4a	0.60a
T2: High N, Standard Ca	0.34c	0.11a	1.32a	0.17a	0.03b	0.26a	9.4a	9.6a	174a	9.6a	30.4a	0.51a
T3: Low N, High Ca	0.69a	0.07b	1.44a	0.23a	0.05a	0.18c	9.0a	6.5b	114a	5.0ab	31.6a	0.33b
T4: Standard N, High Ca	0.56b	0.08b	1.13a	0.20a	0.05a	0.18c	6.4a	5.0c	186a	3.6b	30.4a	0.36b

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 43. Pre-harvest External Soil Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (July 29, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	8.1a[z]	25.0a	28.3ab	0.82a	17.2a	2.72a	10.2a	12.2a	5.2a	18.2a	2.5a	0.28a	0.72a
T2: Higher N, Low Ca	8.0a	23.2a	27.5ab	0.68a	17.1a	2.87a	11.8a	11.1a	4.8a	23.2a	2.8a	0.28a	0.78a
T3: Low N, Medium Ca	8.1a	24.7a	21.8b	0.65a	17.4a	2.85a	10.5a	4.0a	3.6a	15.0a	2.5a	0.30a	0.75a
T4: High N, High Ca	7.9a	26.5a	34.3a	0.79a	17.9a	3.03a	11.7a	7.0a	5.1a	21.7a	3.0a	0.30a	0.72a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 44. Pre-harvest Internal Soil Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (July 29, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	8.0a[z]	26.3ab	39.7a	0.86a	23.9a	2.5a	19.5a	36.4a	23.0a	14.7b	5.7a	0.29a	0.94a
T2: Higher N, Low Ca	8.0a	25.6b	35.7a	0.82a	27.7a	3.0a	16.7a	34.0a	11.1a	15.2b	6.5a	0.29a	1.07a
T3: Low N, Medium Ca	8.0a	27.7ab	32.3a	0.69a	25.2a	2.8a	27.5a	48.8a	14.7a	13.3b	5.7a	0.25a	0.92a
T4: High N, High Ca	7.8a	31.5a	45.2a	0.87a	27.1a	3.2a	8.7a	43.6a	21.0a	22.3a	6.3a	0.27a	0.87a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 45. Pre-harvest Foliar Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (August 05, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Medium Ca	1.8a[z]	0.14a	1.21a	2.5a	0.13a	0.15a	20.2a	11.0a	60.3a	31.7a	34.5a	1.42a
T2: Higher N, Low Ca	1.8a	0.15a	1.19a	2.6a	0.15a	0.16a	22.2a	10.7a	71.3a	32.5a	42.8a	1.47a
T3: Low N, Medium Ca	1.8a	0.16a	1.16a	2.6a	0.17a	0.15a	22.0a	19.7a	65.2a	32.5a	36.7a	1.50a
T4: High N, High Ca	1.8a	0.14a	1.18a	2.6a	0.17a	0.15a	28.4a	19.5a	70.5a	29.7a	43.5a	1.41a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 46. Post-harvest External Soil Analysis-Orchard 1, Ecuador, 'Tommy Atkins-Second Year of Field Study (January 26, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	7.8a[z]	19.8a	32.2b	0.74a	18.7a	3.14a	14.2a	6.2a	6.8a	16.7a	8.5a	0.31a	1.09a
T2: Higher N, Low Ca	7.9a	18.7a	30.7b	0.68a	18.4a	3.08a	9.3a	4.0a	4.5a	17.5a	4.5a	0.28a	1.05a
T3: Low N, Medium Ca	7.8a	20.8a	29.3b	0.71a	18.8a	3.30a	12.3a	4.4a	4.1a	15.5a	7.7a	0.29a	0.97a
T4: High N, High Ca	7.6a	18.2a	40.7a	0.79a	18.8a	3.57a	12.7a	6.9a	5.3a	25.7a	6.2a	0.32a	1.06a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 47. Post-harvest Internal Soil Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-Second Year of Field Study (January 26, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	7.75a[z]	18.5a	47.0ab	0.72a	18.1a	2.5a	13.3a	33.3a	13.6a	14.8b	7.7a	0.35a	1.17a
T2: Higher N, Low Ca	7.7ab	42.3a	40.2bc	0.72a	18.2a	2.8a	15.3a	51.0a	12.8a	16.7b	11.0a	0.50a	1.47a
T3: Low N, Medium Ca	7.8a	19.3a	27.8c	0.56a	18.0a	2.4a	10.8a	40.9a	11.2a	12.7a	7.7a	0.40a	1.07a
T4: High N, High Ca	7.42b	17.8a	56.3a	0.71a	17.6a	2.6a	13.0a	30.2a	15.8a	24.8a	8.3a	0.34a	1.19a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 48. Post-harvest Foliar Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-Second Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Medium Ca	1.85a[z]	0.12a	0.93a	2.85a	0.21a	0.088a	14.8a	9.7a	90.7a	31.7a	34.8a	1.54a
T2: Higher N, Low Ca	1.80a	0.12a	1.03a	3.28a	0.21a	0.088a	15.3a	9.7a	87.2a	33.2a	41.5a	1.84a
T3: Low N, Medium Ca	1.73a	0.13a	1.10a	3.28a	0.23a	0.085a	19.7a	9.5a	120.3a	40.8a	35.7a	1.90a
T4: High N, High Ca	1.73a	0.13a	1.05a	3.04a	0.21a	0.085a	20.8a	10.0a	103.7a	28.2a	35.0a	1.76a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 49. First Fruit Analysis (average diameter fruit= 0.51 cm) Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (October 27, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	1.5a[z]	0.21a	1.6a	0.28a	0.11a	0.08a	12.0b	11.0a	26.3a	10.3a	15.3a	0.19a
T2: Higher N, Low Ca	1.6a	0.25a	1.8a	0.37a	0.14a	0.09a	13.8b	11.4a	34.8a	11.0a	13.8a	0.23a
T3: Low N, Medium Ca	1.8a	0.29a	2.0a	0.31a	0.15a	0.10a	19.3a	12.3a	40.3a	12.8a	22.0a	0.18a
T4: High N, High Ca	1.7a	0.26a	1.8a	0.31a	0.14a	0.09a	16.2ab	12.8a	35.6a	12.6a	19.4a	0.18a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 50. Second Fruit Analysis (average diameter fruit= 1.74 cm) Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (November 10, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	1.17a[z]	0.23a	2.13a	0.31a	0.16a	0.08a	12.3b	11.7a	65.3a	8.3a	9.3a	0.27a
T2: Higher N, Low Ca	1.08a	0.23a	1.98a	0.28a	0.16a	0.07a	13.6ab	11.6a	71.4a	7.4a	9.6a	0.26a
T3: Low N, Medium Ca	1.10a	0.22a	1.69a	0.30a	0.17a	0.07a	14.8a	11.8a	76.3a	13.5a	10.0a	0.27a
T4: High N, High Ca	1.08a	0.22a	2.06a	0.29a	0.16a	0.07a	13.0b	11.2a	80.4a	6.6a	10.6a	0.27a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 51. Third Fruit Analysis (average diameter fruit= 3.28 cm) Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (November 23, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	0.98a[z]	0.22a	1.27a	0.27a	0.09a	0.04a	8.8a	8.8a	53.3a	5.0a	7.5a	0.27a
T2: Higher N, Low Ca	0.96a	0.19a	1.27a	0.35a	0.10a	0.05a	9.5a	8.9a	47.6a	6.2a	7.8a	0.36a
T3: Low N, Medium Ca	0.90a	0.19a	1.26a	0.30a	0.09a	0.04a	9.8a	8.5a	51.5a	5.8a	8.0a	0.33a
T4: High N, High Ca	0.92a	0.19a	1.32a	0.36a	0.10a	0.05a	9.8a	8.3a	52.2a	5.8a	8.4a	0.40a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 52. Fourth Fruit Analysis (average diameter fruit= 5.69 cm) Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (December 07, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	0.80a[z]	0.12a	1.11a	0.18a	0.07a	0.03a	7.0a	6.5a	69.5a	3.8a	7.3a	0.22a
T2: Higher N, Low Ca	0.74a	0.11a	1.03a	0.18a	0.06a	0.04a	5.6b	18.4a	55.8a	4.6a	7.4a	0.24a
T3: Low N, Medium Ca	0.65a	0.11a	1.11a	0.18a	0.06a	0.03a	6.5ab	6.3a	64.0a	3.5a	8.0a	0.29a
T4: High N, High Ca	0.68a	0.10a	1.03a	0.18a	0.06a	0.03a	5.6b	5.4a	63.8a	4.4a	8.6a	0.28a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 53. Fifth Fruit Analysis (average diameter fruit= 7.54 cm) Orchard 1, Ecuador, 'Tommy Atkins' – Second Year of Field Study (December 22, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	0.65a[z]	0.12a	1.01a	0.21a	0.07a	0.03a	6.0a	5.5a	73.8a	3.3a	7.8a	0.33a
T2: Higher N, Low Ca	0.60a	0.10a	0.87a	0.27a	0.06a	0.03a	6.4a	5.6a	78.2a	4.6a	7.4a	0.49a
T3: Low N, Medium Ca	0.63a	0.11a	1.04a	0.24a	0.06a	0.03a	5.5a	6.0a	92.5a	3.0a	6.8a	0.37a
T4: High N, High Ca	0.54a	0.09a	0.96a	0.20a	0.06a	0.03a	6.6a	5.2a	88.6a	4.6a	6.8a	0.38a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 54. Pre-harvest Soil-External Analysis – Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (July 16, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{ml}\right)$	P $\left(\frac{\mu g}{ml}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{ml}\right)$	Zn $\left(\frac{\mu g}{ml}\right)$	Cu $\left(\frac{\mu g}{ml}\right)$	Fe $\left(\frac{\mu g}{ml}\right)$	Mn $\left(\frac{\mu g}{ml}\right)$	B $\left(\frac{\mu g}{ml}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	6.6a[z]	22.5a	39.8a	12.7a	1.09a	9.5a	2.0a	4.8a	3.5a	178.6a	12.8a	0.21a	0.05a
T2: Higher N, Low Ca	6.3a	20.5a	34.0a	12.3a	0.88a	8.3a	2.3a	5.1a	4.1a	199.5a	13.0a	0.22a	0.04a
T3: Low N, Medium Ca	6.1a	24.7a	30.8a	13.3a	1.05a	9.2a	2.1a	4.0a	3.9a	166.5a	13.2a	0.18a	0.04a
T4: High N, High Ca	6.4a	23.8a	31.3a	15.0a	0.84a	8.6a	2.0a	5.8a	4.3a	178.2a	15.8a	0.21a	0.04a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 55. Pre-harvest Soil-Internal Analysis – Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (July 16, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{ml}\right)$	P $\left(\frac{\mu g}{ml}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{ml}\right)$	Zn $\left(\frac{\mu g}{ml}\right)$	Cu $\left(\frac{\mu g}{ml}\right)$	Fe $\left(\frac{\mu g}{ml}\right)$	Mn $\left(\frac{\mu g}{ml}\right)$	B $\left(\frac{\mu g}{ml}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	6.3a[z]	27.0b	118a	43.5a	0.89a	10.7a	2.07a	15.2a	11.1a	239.8a	14.5a	0.26a	0.035a
T2: Higher N, Low Ca	6.4a	24.7b	112a	16.8a	0.87a	9.5a	2.26a	14.0a	14.5a	235.3a	16.3a	0.26a	0.037a
T3: Low N, Medium Ca	6.4a	41.8a	104a	63.8a	1.01a	11.4a	2.04a	11.6a	22.0a	209.0a	15.5a	0.27a	0.026a
T4: High N, High Ca	6.5a	35.2ab	107a	65.0a	0.91a	10.4a	1.99a	17.7a	15.2a	186.2a	14.3a	0.31a	0.029a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 56. Pre-harvest Foliar Analysis – Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (July 22, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.70a[z]	0.11a	0.95a	2.4a	0.18a	0.18a	66.0a	8.8a	166.5a	593a	40.3a	1.42a
T2: Higher N, Low Ca	1.67a	0.11a	0.91a	2.5a	0.19a	0.18a	71.3a	8.0a	160.0a	589a	53.7a	1.48a
T3: Low N, Medium Ca	1.68a	0.11a	0.92a	2.4a	0.19a	0.18a	70.0a	7.7a	146.7a	532a	50.3a	1.41a
T4: High N, High Ca	1.62a	0.11a	0.82a	2.5a	0.19a	0.19a	61.2a	7.8a	166.5a	576a	36.8a	1.56a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 57. Post-harvest Soil-Internal Analysis – Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (February 04, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{\mu g}{cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$	Mn	B	Ca/N
T1: High N, Medium Ca	6.4ab$_z$	20.2a	197a	0.81a	9.7a	4.0a	20.5a	22.5b	14.5a	278.5a	31.8a	0.25a	0.50a
T2: Higher N, Low Ca	6.0b	20.8a	214a	0.74a	8.5a	3.6a	20.0a	37.7a	15.7a	362.0a	35.5a	0.25a	0.46a
T3: Low N, Medium Ca	6.4ab	24.0a	175a	0.91a	10.9a	4.0a	24.5a	20.4b	20.5a	245.7a	31.0a	0.21a	0.54a
T4: High N, High Ca	6.6a	15.0a	165a	0.81a	9.8a	3.8a	19.3a	23.5ab	14.8a	248.0a	30.8a	0.25a	0.66a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 58. Post-harvest Soil-External Analysis – Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (February 04, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{ml}\right)$	P $\left(\frac{\mu g}{ml}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{ml}\right)$	Zn $\left(\frac{\mu g}{ml}\right)$	Cu $\left(\frac{\mu g}{ml}\right)$	Fe $\left(\frac{\mu g}{ml}\right)$	Mn $\left(\frac{\mu g}{ml}\right)$	B $\left(\frac{\mu g}{ml}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	6.2a$_z$	15.5a	37.7a	0.94a	12.2a	3.3a	16.5a	5.0a	4.4a	213a	25.5a	0.30a	0.94a
T2: Higher N, Low Ca	5.9a	10.7a	37.2a	0.66ab	12.6a	33.9a	21.7a	4.4a	6.0a	165a	23.0a	0.30a	1.68a
T3: Low N, Medium Ca	5.9a	14.7a	22.5a	0.57b	12.5a	4.7a	17.8a	5.4a	5.8a	112a	33.7a	0.27a	0.87a
T4: High N, High Ca	6.2a	13.7a	25.7a	0.59a	11.5a	5.3a	11.2a	4.0a	9.1a	151a	28.3a	0.28a	0.97a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 59. Post-harvest Foliar Analysis-Orchard 2, Ecuador, 'Ataulfo'-Second Year of Field Study (February 17, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.97a[z]	0.13a	1.03a	1.64a	0.22a	0.09a	10.7a	7.3a	36.7a	170.7a	35.0a	0.84a
T2: Higher N, Low Ca	1.93a	0.12a	1.32a	1.52a	0.19b	0.08a	11.5a	7.5a	41.2a	184.8a	39.8a	0.80a
T3: Low N, Medium Ca	1.85a	0.12a	1.15a	1.67a	0.21ab	0.09a	10.2a	8.5a	39.3a	183.0a	37.0a	0.90a
T4: High N, High Ca	1.93a	0.12a	1.14a	1.76a	0.21ab	0.08a	11.3a	7.7a	37.5a	188.7a	32.2a	0.92a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 60. First Fruit Analysis (average diameter fruit= 0.51 cm) Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (August 11, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.68a[z]	0.18a	1.49a	0.45a	0.18a	0.10a	19.7a	9.3a	67.3a	115a	14.0a	0.27a
T2: Higher N, Low Ca	1.73a	0.20a	1.50a	0.45a	0.18a	0.10a	21.3a	10.2a	57.2a	112a	14.7a	0.27a
T3: Low N, Medium Ca	1.70a	0.20a	1.55a	0.42a	0.17a	0.10a	19.3a	10.0a	60.2a	113a	15.5a	0.25a
T4: High N, High Ca	1.58a	0.19a	1.48a	0.44a	0.16a	0.10a	19.7a	10.7a	60.2a	109a	15.0a	0.27a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 61. Second Fruit Analysis (average diameter fruit= 1.80 cm) Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (September 04, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.28a[z]	0.15b	1.47a	0.23a	0.10a	0.07a	16.3a	10.2a	43.3a	50.8a	12.5a	0.18a
T2: Higher N, Low Ca	1.38a	0.17ab	1.46a	0.22a	0.09a	0.07a	15.8a	10.7a	66.5a	50.3a	10.8a	0.16ab
T3: Low N, Medium Ca	1.42a	0.23a	1.47a	0.22a	0.09a	0.07a	17.5a	10.5a	55.8a	50.0a	11.2a	0.15b
T4: High N, High Ca	1.50a	0.16ab	1.47a	0.21a	0.10a	0.07a	17.8a	10.7a	59.0a	49.7a	11.7a	0.14b

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 62. Third Fruit Analysis (average diameter fruit= 2.99 cm) Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (September 21, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	0.78a[z]	0.12a	1.29a	0.19a	0.08a	0.05a	10.5a	7.8b	58.5a	25.8a	17.5a	0.24a
T2: Higher N, Low Ca	0.84a	0.12a	1.31a	0.16a	0.07a	0.06a	10.3a	8.7ab	60.3a	26.2a	19.5a	0.19a
T3: Low N, Medium Ca	0.80a	0.10a	1.39a	0.14a	0.08a	0.05a	8.8a	9.7a	54.7a	17.5a	11.8a	0.18a
T4: High N, Low Ca	0.84a	0.11a	1.33a	0.14a	0.08a	0.05a	9.2a	8.8ab	62.5a	20.3a	13.2a	0.17a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca

[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 63. Fourth Fruit Analysis (average diameter fruit= 3.77 cm) Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (October 06, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	0.90a[z]	0.14a	1.21a	0.22a	0.08a	0.05a	9.7a	8.8a	53.3a	20.3a	18.0a	0.24a
T2: Higher N, Low Ca	0.97a	0.14a	1.31a	0.30a	0.08a	0.05a	10.5a	8.3a	35.3a	20.0a	19.8a	0.31a
T3: Low N, Medium Ca	1.08a	0.14a	1.38a	0.28a	0.09a	0.05a	9.5a	8.5a	48.5a	17.5a	20.7a	0.25a
T4: High N, High Ca	1.03a	0.14a	1.22a	0.26a	0.08a	0.06a	10.8a	9.0a	37.5a	21.2a	21.7a	0.23a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 64. Fifth Fruit Analysis (average diameter fruit= 4.57 cm) Orchard 2, Ecuador, 'Ataulfo' – Second Year of Field Study (October 27, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.02ab[z]	0.18a	1.64a	0.24a	0.10a	0.05a	13.2a	11.5a	37.8a	14.7a	12.3a	0.24a
T2: Higher N, Low Ca	1.15a	0.18a	1.58a	0.24a	0.09a	0.05a	13.2a	11.3a	42.5a	13.0a	12.8a	0.22a
T3: Low N, Medium Ca	0.95b	0.17a	1.51a	0.26a	0.08a	0.05a	12.0a	11.3a	40.3a	12.8a	11.7a	0.28a
T4: High N, High Ca	1.03ab	0.18a	1.57a	0.25a	0.09a	0.05a	12.8a	11.8a	40.0a	12.7a	11.2a	0.25a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 65. Pre-harvest Soil-Trench Analysis – Orchard 1, Peru, 'Kent' – Third Year of Field Study (August 31, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Low N, High Ca	7.5b[z]	2.6a	219a	0.21a	4.1a	1.21a	17.8a	23.7a	11.8a	93.0a	8.9ab	0.96bc	1.63a
T2: Low N, Low Ca	7.7b	2.6a	198a	0.20a	3.1b	0.85b	30.8a	8.04a	8.8a	19.2b	4.8b	1.49a	1.32a
T3: High N, High Ca	7.4b	2.4a	157a	0.12b	3.4ab	1.09ab	17.6a	51.6a	20.0a	39.2b	11.6a	0.81c	1.52a
T4: High N, Low Ca	8.1a	2.8a	206a	0.18ab	3.7ab	1.09ab	21.0a	20.3a	31.5a	30.8b	14.3a	1.20ab	1.26a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 66. Pre-harvest Soil-Row Analysis – Orchard 1, Peru, 'Kent' – Third Year of Field Study (August 31, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Low N, High Ca	7.8a[z]	6.0a	183ab	0.38a	3.9a	1.25a	38.0a	58.0a	12.3b	41.6a	11.7ab	1.63a	1.08a
T2: Low N, Low Ca	7.4b	7.6a	164ab	0.51a	3.3a	1.12a	51.6a	44.1ab	48.9a	29.6a	15.8a	1.69a	0.95a
T3: High N, High Ca	7.4b	3.0a	156b	0.32a	3.1a	1.26a	29.6a	6.7b	6.8b	42.4a	8.1b	1.20a	1.04a
T4: High N, Low Ca	7.5b	3.6a	199a	0.47a	3.0a	1.20a	61.4a	19.3ab	12.3b	24.2a	9.2b	1.67a	0.85a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 67. Pre-harvest Foliar Analysis – Orchard 1, Peru, 'Kent' – Third Year of Field Study (August 31, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N (%)
T1: Low N, High Ca	1.10a[z]	0.116ab	0.86ab	2.4a	0.24a	0.13a	28.4a	7.5a	185a	40.6a	150a	2.2a
T2: Low N, Low Ca	1.09a	0.112ab	1.00a	2.0a	0.25a	0.14a	26.6a	7.4a	137a	37.6a	144a	1.9a
T3: High N, High Ca	1.02a	0.108b	0.78b	2.2a	0.27a	0.13a	25.8a	10.4a	148a	45.2a	158a	2.1a
T4: High N, Low Ca	1.01a	0.122a	0.85ab	2.3a	0.25a	0.14a	19.2b	7.0a	189a	25.2b	157a	2.3a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 68. Post-harvest Soil-Trench Analysis – Orchard 1, Peru, 'Kent' – Third Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Low N, High Ca	7.7a[z]	2.2c	266.8a	0.30a	3.28a	1.07a	30.0a	19.2b	24.4a	51.4a	12.1ab	0.38b	1.54a
T2: Low N, Low Ca	7.9a	2.4c	190.2b	0.29a	2.62b	0.90b	28.0a	21.8b	10.1a	15.6a	7.8ab	0.47ab	1.14a
T3: High N, High Ca	7.9a	30.6b	197.8b	0.22a	3.74a	1.12a	22.4ab	58.6a	19.7a	35.2a	10.5ab	0.32b	0.12c
T4: High N, Low Ca	7.8a	34.4a	192.4b	0.20a	3.28a	1.04a	18.0b	47.9ab	26.2a	32.0a	15.0a	0.63a	0.09c

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 69. Post-harvest Soil-Row Analysis – Orchard 1, Peru, 'Kent' – Third Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Low N, High Ca	7.8a[z]	2.4c	182.4a	0.62b	3.48a	1.15a	48.0a	26.5a	37.3a	27.4a	11.4a	1.25a	1.52a
T2: Low N, Low Ca	7.9a	2.2c	202.6a	1.01a	2.48b	1.01a	50.4a	17.8ab	46.8a	16.4b	13.4a	1.05a	1.17a
T3: High N, High Ca	7.9a	14.4b	186.0a	0.98a	2.26b	0.96a	41.4a	7.9b	6.36a	12.2b	7.5a	0.94a	0.65b
T4: High N, Low Ca	8.1a	30.2a	215.0a	0.99a	2.46b	1.08a	49.4a	15.4ab	11.9a	18.4ab	23.4a	1.05a	0.08c

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 70. Post-harvest Foliar Analysis – Orchard 1, Peru, 'Kent' – Third Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	1.42a[z]	0.17a	1.25a	2.18a	0.27a	0.25a	15.4ab	7.96a	198.0a	59.2a	165.8a	1.55a
T2: Low N, Low Ca	1.43a	0.16a	1.22a	2.74a	0.29a	0.25a	17.8a	7.50a	221.6a	38.0b	163.6a	1.94a
T3: High N, High Ca	1.46a	0.16a	1.29a	2.44a	0.26a	0.23a	16.0ab	7.64a	223.0a	49.6ab	162.0a	1.69a
T4: High N, Low Ca	1.51a	0.16a	1.36a	2.27a	0.23b	0.23a	10.8b	6.88a	192.8a	37.8b	169.2a	1.51a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 71. First Fruit Analysis (average diameter fruit= 0.5 cm) Orchard 1, Peru, 'Kent' – Third Year of Field Study (October 12, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	0.85a[z]	0.17a	1.3a	0.5a	0.10a	0.14a	17.4a	10.7a	106a	15.2a	67.2a	0.63a
T2: Low N, Low Ca	0.48b	0.19a	1.4a	0.3a	0.10	0.14a	15.8a	13.7a	137a	12.4a	45.4a	0.74a
T3: High N, High Ca	0.91a	0.21a	1.6a	0.6a	0.13a	0.14a	19.0a	16.4a	164a	13.0a	50.4a	0.69a
T4: High N, Low Ca	0.91a	0.23a	1.6a	0.4a	0.12a	0.15a	15.4a	7.4a	73a	16.4a	49.0a	0.46a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 72. Second Fruit Analysis (average diameter fruit= 2.8 cm) Orchard 1, Peru, 'Kent' – Third Year of Field Study (November 03, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	1.87a[z]	0.22a	1.33a	0.21a	0.06a	0.22a	13.8a	7.9a	49.6a	11.6a	60.2a	0.12a
T2: Low N, Low Ca	1.87a	0.22a	1.38a	0.19a	0.06a	0.22a	16.2a	6.7a	31.0a	11.6a	49.6a	0.10a
T3: High N, High Ca	1.59a	0.19a	1.38a	0.19a	0.06a	0.22a	15.2a	6.1a	43.8a	11.8a	57.2a	0.12a
T4: High N, Low Ca	1.68a	0.20a	1.37a	0.14a	0.05a	0.21a	14.4a	5.8a	45.4a	12.0a	69.8a	0.09a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 73. Third Fruit Analysis (average diameter fruit= 5.4 cm) Orchard 1, Peru, 'Kent' – Third Year of Field Study (November 03, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	0.81a[z]	0.14a	0.66c	0.21a	0.04a	0.22a	5.8b	3.7b	35.0c	7.0b	79.8b	0.26a
T2: Low N, Low Ca	0.76a	0.15a	0.74bc	0.13b	0.04a	0.22a	9.6a	5.5ab	40.8bc	14.2ab	69.0c	0.17b
T3: High N, High Ca	0.83a	0.19a	1.06a	0.13ab	0.04a	0.24a	7.8ab	5.8a	65.2ab	17.6a	89.4a	0.16b
T4: High N, Low Ca	0.78a	0.20a	0.84b	0.15ab	0.04a	0.24a	9.4a	3.5b	73.8a	14.0ab	91.4a	0.19ab

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 74. Fourth Fruit Analysis (average diameter fruit= 7.1 cm) Orchard 1, Peru, 'Kent' – Third Year of Field Study (December 03, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	0.59b[z]	0.13c	0.60c	0.25a	0.04b	0.25a	7.2a	5.2a	55.4a	6.2c	62.2b	0.45a
T2: Low N, Low Ca	0.59b	0.18b	0.65bc	0.23a	0.04b	0.25a	10.2a	6.9a	45.2a	8.4c	69.0b	0.39a
T3: High N, High Ca	0.76a	0.22a	1.09a	0.23a	0.06a	0.25a	10.8a	5.3a	115.4a	18.2a	82.6a	0.31a
T4: High N, Low Ca	0.60ab	0.18b	0.75b	0.22a	0.05ab	0.25a	9.0a	6.0a	47.8a	13.0b	81.2a	0.39a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 75. Fifth Fruit Analysis (average diameter fruit= 8.9 cm) Orchard 1, Peru, 'Kent' – Third Year of Field Study (December 18, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	0.48a[z]	0.12ab	1.07a	0.08a	0.05a	0.19a	7.6a	3.7a	35.6a	2.0a	58.8a	0.17a
T2: Low N, Low Ca	0.40a	0.11b	1.04a	0.08a	0.05a	0.18a	7.4a	3.2a	37.6a	2.2a	64.4a	0.20a
T3: High N, High Ca	0.42a	0.14a	1.26a	0.08a	0.05a	0.18a	7.2a	3.4a	30.6a	2.0a	59.0a	0.21a
T4: High N, Low Ca	0.44a	0.14a	1.18a	0.07a	0.05a	0.19a	7.6a	3.3a	21.8a	2.4a	62.0a	0.15a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 76. Pre-harvest Soil-Trench Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (August 31, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Low Ca	7.3a[z]	34.8ab	18.4b	0.8a	33.4ab	5.1a	447a	3.7a	1.6b	14.8ab	25.1ab	2.6b	1.0b
T2: Higher N, Low Ca	6.8a	45.8a	20.2b	1.2a	46.6a	5.1a	415a	7.6a	1.8ab	17.2ab	40.6a	3.0b	1.0b
T3: Low N, High Ca	7.4a	3.6c	14.8b	0.6a	32.3ab	5.4a	402a	2.5a	1.6ab	14.8ab	19.8b	3.0b	10.0a
T4: High N, High Ca	7.4a	4.4c	11.4b	1.1a	56.0a	4.8a	431a	3.3a	1.8ab	9.6b	23.0b	3.4b	12.0a
T5: Low N, Low Ca	7.0a	23.2b	72.6a	1.2a	19.4b	4.8a	368a	13.8a	2.8a	25.0a	22.9b	4.6a	1.11b

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 77. Pre-harvest Soil-Row Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (August 31, 2015).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Low Ca	7.2a[z]	16.0ab	25.2b	0.93bc	22.2ab	5.3ab	54.3b	2.1a	2.1a	17.4a	34.3a	3.5a	2.5bc
T2: Higher N, Low Ca	7.2a	20.8a	27.8b	1.11ab	27.6a	5.5a	63.3ab	2.7a	2.4a	7.6a	29.0a	3.7a	1.4c
T3: Low N, High Ca	7.3a	9.4bc	20.4b	0.81c	26.7ab	5.5a	62.8ab	1.4a	2.6a	12.0a	22.5ab	3.4a	4.5ab
T4: High N, High Ca	7.4a	3.6c	23.6b	0.87bc	24.6ab	5.3ab	117.2a	2.0a	3.4a	18.0a	22.5ab	3.5a	6.8a
T5: Low N, Low Ca	7.4a	9.2bc	54.2a	1.20a	20.8b	5.0b	70.0ab	2.7a	2.3a	16.4a	13.1b	4.6a	2.9bc

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 78. Pre-harvest Foliar Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (August 31, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	1.40b[z]	0.10a	0.86c	3.53bc	0.24ab	0.15a	23.6a	19.4b	194b	71.2b	113.8a	2.5b
T2: Higher N, Low Ca	1.55ab	0.09ab	0.10abc	3.77b	0.26a	0.13a	27.2a	28.2a	282a	98.8ab	24.6a	2.5b
T3: Low N, High Ca	1.45b	0.09ab	1.04a	3.53bc	0.24ab	0.13a	21.0a	19.1b	191b	95.0ab	14.4a	2.4bc
T4: High N, High Ca	1.66a	0.09ab	1.00ab	3.41c	0.22bc	0.13a	21.6a	22.9ab	229ab	105.0ab	123.8a	2.1c
T5: Low N, Low Ca	1.21c	0.07b	0.87bc	4.56a	0.19c	0.16a	24.2a	5.5c	55.2c	135.8a	126.0a	3.8a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 79. Post-harvest Soil-Trench Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Low Ca	7.6a[z]	6.4b	35.6a	0.84a	17.3b	4.76c	191a	11.5a	3.64a	18.6a	13.8a	2.27ab	4.67b
T2: Higher N, Low Ca	7.6a	32.2a	25.2a	0.81a	80.1ab	4.97bc	339a	9.4a	2.64ab	18.8a	14.0a	1.99bc	2.55b
T3: Low N, High Ca	7.7a	32.6a	26.0a	0.83a	99.7a	4.95c	445a	8.6a	1.98b	11.6a	15.4a	1.93bc	3.27b
T4: High N, High Ca	7.6a	17.4b	20.2a	0.73a	86.7a	5.40a	175a	10.5a	2.10ab	9.6a	24.5a	1.73c	4.78b
T5: Low N, Low Ca	7.5a	11.6b	46.8a	0.86a	90.5a	5.33ab	191a	14.0a	3.06ab	8.0a	17.1a	2.57a	7.54a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 80. Post-harvest Soil-Row Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Low Ca	7.6a[z]	12.2ab	41.8a	0.92a	18.2b	5.0a	97.6b	19.8a	4.18a	21.2a	15.1ab	2.5a	2.43a
T2: Higher N, Low Ca	7.7a	22.2ab	24.2a	0.86a	45.5ab	4.7a	287.4a	11.2a	2.56b	10.6a	16.1ab	2.2a	2.17a
T3: Low N, High Ca	7.5a	24.4a	25.8a	0.83a	79.8a	5.1a	193.8ab	11.0a	2.12b	9.4a	14.7ab	1.8a	3.20a
T4: High N, High Ca	7.5a	13.0ab	54.8a	0.98a	66.9ab	5.2a	83.8b	11.8a	2.34b	23.8a	20.4a	2.3a	4.82a
T5: Low N, Low Ca	7.7a	10.0b	26.8a	0.83a	50.4ab	4.9a	106.8b	11.2a	2.34b	11.6a	9.9b	1.9a	4.86a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 81. Post-harvest Foliar Analysis – Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (February 10, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	1.24ab[z]	0.19a	1.19a	3.38a	0.22a	0.21b	37.0ab	6.5a	204a	130a	153b	2.79a
T2: Higher N, Low Ca	1.08b	0.18a	1.16a	3.29a	0.23a	0.23ab	40.4a	7.9a	201a	128a	160ab	3.05a
T3: Low N, High Ca	1.36a	0.17a	1.10a	3.19a	0.22a	0.23ab	40.8ab	6.0a	219a	122a	156ab	2.38a
T4: High N, High Ca	1.20ab	0.18a	1.06a	3.72a	0.22a	0.25a	20.0b	7.3a	222a	104a	161ab	3.16a
T5: Low N, Low Ca	1.36a	0.19a	1.06a	3.24a	0.21a	0.24ab	25.0ab	7.0a	238a	126a	162a	2.41a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 82. First Fruit Analysis (average diameter fruit= 0.5 cm) Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (October 06, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	No fruit available											
T2: Higher N, Low Ca	1.72a[z]	0.28a	1.91a	0.24a	0.06a	0.17a	13.0b	4.8a	48.0a	13.0a	74.0a	0.14a
T3: Low N, High Ca	1.46a	0.28a	1.90a	0.25a	0.06a	0.18a	18.7b	14.1a	141.0a	12.3a	77.7a	0.18a
T4: High N, High Ca	1.80a	0.27a	2.16a	0.19a	0.07a	0.21a	17.3b	6.1a	60.7a	32.7a	75.7a	0.11a
T5: Low N, Low Ca	1.79a	0.25a	1.88a	0.26a	0.20a	0.19a	25.5a	9.4a	94.0a	19.0a	51.0a	0.14a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 83. Second Fruit Analysis (average diameter fruit= 2.5 cm) Orchard 2, Peru, 'Kent' – Second Year of Data Collection on the Third Year of Field Study (December 08, 2015).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	No fruit available											
T2: Higher N, Low Ca	0.68a[z]	0.22a	0.91a	0.15ab	0.04a	0.25b	9.5a	6.1a	36.0a	7.5a	70.0a	0.22a
T3: Low N, High Ca	0.67a	0.16a	0.84a	0.16ab	0.04a	0.27ab	5.0a	4.0a	48.7a	6.7a	57.0ab	0.25a
T4: High N, High Ca	0.81a	0.15a	0.93a	0.21a	0.04a	0.26ab	4.0a	5.4a	35.3a	6.0a	52.0b	0.26a
T5: Low N, Low Ca	0.69a	0.17a	0.67a	0.13b	0.04a	0.27a	4.8a	3.9a	36.5a	10.3a	55.3ab	0.21a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 84. Pre-harvest External Soil (Outside of the irrigation drip line) Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (June 06, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{meq}{100cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{\mu g}{cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	7.8a[z]	19.8a	32.2b	0.74a	18.7a	3.14a	14.2a	6.2a	6.8a	16.7a	8.5a	0.31a	1.09a
T2: Higher N, Low Ca	7.9a	18.7a	30.7b	0.68a	18.4a	3.08a	9.3a	4.0a	4.5a	17.5a	4.5a	0.28a	1.05a
T3: Low N, Medium Ca	7.8a	20.8a	29.3b	0.71a	18.8a	3.30a	12.3a	4.4a	4.1a	15.5a	7.7a	0.29a	0.97a
T4: High N, High Ca	7.6a	18.2a	40.7a	0.79a	18.8a	3.57a	12.7a	6.9a	5.3a	25.7a	6.2a	0.32a	1.06a

[y] T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 85. Pre-harvest Internal Soil (at the irrigation drip line) – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (June 06, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{meq}{100cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{\mu g}{cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	7.75a$_z$	18.5a	47.0ab	0.72a	18.1a	2.5a	13.3a	33.3a	13.6a	14.8b	7.7a	0.35a	1.17a
T2: Higher N, Low Ca	7.7ab	42.3a	40.2bc	0.72a	18.2a	2.8a	42.8a	51.0a	45.6a	16.7b	11.0a	0.50a	1.47a
T3: Low N, Medium Ca	7.8a	19.3a	27.8c	0.56a	18.0a	2.4a	10.8a	40.9a	11.2a	12.7a	7.7a	0.40a	1.07a
T4: High N, High Ca	7.42b	17.8a	56.3a	0.71a	17.6a	2.6a	13.0a	30.2a	15.8a	24.8a	8.3a	0.34a	1.19a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 86. Pre-harvest Foliar Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (June 10, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Medium Ca	1.85a$_z$	0.12a	0.93a	2.85a	0.21a	0.088a	14.8a	9.7a	90.7a	31.7a	34.8a	1.54a
T2: Higher N, Low Ca	1.80a	0.12a	1.03a	3.28a	0.21a	0.088a	15.3a	9.7a	87.2a	33.2a	41.5a	1.84a
T3: Low N, Medium Ca	1.73a	0.13a	1.10a	3.28a	0.23a	0.085a	19.7a	9.5a	120.3a	40.8a	35.7a	1.90a
T4: High N, High Ca	1.73a	0.13a	1.05a	3.04a	0.21a	0.085a	20.8a	10.0a	103.7a	28.2a	35.0a	1.76a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 87. Post-harvest External Soil (Outside of the irrigation drip line) Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (January 19, 2017).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$	
T1: High N, Medium Ca		8.2a[z]	22.8a	50.2a	0.72a	16.5a	2.87a	32.0a	6.4a	6.1a	28.0a	6.8a	1.25a	0.76a
T2: Higher N, Low Ca		8.1a	20.0a	55.0a	0.76a	17.1a	2.59a	31.3a	12.7a	7.5a	31.5a	6.8a	1.23a	0.94a
T3: Low N, Medium Ca		8.1a	18.7a	63.2a	0.76a	16.5a	3.78a	33.0a	7.1a	7.7a	39.8a	7.2a	1.28a	0.92a
T4: High N, High Ca		8.0a	19.8a	71.2a	0.72a	16.3a	3.54a	41.7a	6.01a	7.0a	40.0a	7.7a	1.20a	0.85a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 88. Post-harvest Internal Soil (at the irrigation drip line) Analysis-Orchard 1, Ecuador, 'Tommy Atkins'-Third Year of Field Study (January 19, 2017).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{meq}{100cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{\mu g}{cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	8.3a[z]	20.0a	69.0a	0.73ab	16.8a	2.1b	29.2a	56.4a	44.5a	23.0a	4.3ab	1.12a	0.90a
T2: Higher N, Low Ca	7.9b	17.2a	67.8a	0.60b	17.2a	2.8a	33.3a	76.0a	87.3a	25.8a	5.2a	0.92b	1.08a
T3: Low N, Medium Ca	8.1a	14.5a	83.7a	0.79a	17.0a	2.5ab	28.8a	84.1a	35.4a	28.3a	4.2ab	1.02ab	1.27a
T4: High N, High Ca	7.9b	15.0a	131.7a	0.76a	17.5a	2.9a	35.8a	85.4a	86.1a	33.7a	3.2b	1.08ab	1.22a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 89. Post-harvest Foliar Analysis – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (January 19, 2017).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Medium Ca	1.35a[z]	0.10a	0.87a	1.64a	0.13a	0.08a	18.3a	9.3a	122a	31.3a	62.7a	1.42a
T2: Higher N, Low Ca	1.38a	0.10a	0.91a	1.84a	0.11a	0.07a	16.8a	8.5a	96.5a	32.7a	55.8a	1.34a
T3: Low N, Medium Ca	1.40a	0.11a	0.94a	1.57a	0.13a	0.08a	18.3a	9.2a	98.0a	35.2a	65.3a	1.13a
T4: High N, High Ca	1.43a	0.10a	0.83a	2.08a	0.13a	0.08a	20.5a	9.3a	134.2a	40.7a	75.5a	1.45a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 90. First Fruit Analysis (average diameter fruit= 0.51 cm) – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (August 03, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	2.1bc[z]	0.37a	1.74b	0.53ab	0.14a	0.11a	18.0a	121.2a	33.7a	21.2a	8.0a	0.25a
T2: Higher N, Low Ca	2.0c	0.38a	1.87ab	0.51b	0.13a	0.11a	19.3a	64.5a	20.2a	23.8a	8.5a	0.25a
T3: Low N, Medium Ca	2.3a	0.36a	2.00a	0.71ab	0.14a	0.12a	20.2a	200.0a	22.2a	27.7a	11.5a	0.31a
T4: High N, High Ca	2.2ab	0.34a	1.93ab	0.78a	0.14a	0.11a	18.3a	238.3a	22.8a	24.5a	14.3a	0.35a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 91. Second Fruit Analysis (average diameter fruit= 1.74 cm) – Orchard 1, Ecuador, 'Tommy Atkins' – Third Year of Field Study (August 23, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	0.87a[z]	0.21a	1.08a	0.79a	0.07a	0.07a	14.7a	11.8a	81.8a	5.0a	8.5a	0.96a
T2: Higher N, Low Ca	0.83a	0.20a	0.91a	0.72a	0.05a	0.06a	12.8a	10.2a	110.0a	12.8a	9.8a	0.84a
T3: Low N, Medium Ca	0.92a	0.23a	1.11a	0.75a	0.07a	0.06a	16.2a	12.2a	88.5a	2.7a	10.0a	0.80a
T4: High N, High Ca	0.98a	0.24a	1.28a	0.53a	0.08a	0.06a	15.7a	11.5a	105.8a	5.3a	9.3a	0.58a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 92. Third Fruit Analysis (average diameter fruit= 3.28 cm)-Orchard 1, Ecuador, 'Tommy Atkins'-Third Year of Field Study (September 18, 2017).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn $\left(\frac{mg}{L}\right)$	Cu $\left(\frac{mg}{L}\right)$	Fe $\left(\frac{mg}{L}\right)$	Mn $\left(\frac{mg}{L}\right)$	B $\left(\frac{mg}{L}\right)$	Ca/N
T1: High N, Medium Ca	0.68a[z]	0.11a	1.34a	0.16b	0.06a	0.02a	6.2a	4.7b	34.3b	2.3a	8.8a	0.24b
T2: Higher N, Low Ca	0.65a	0.09b	1.14b	0.16b	0.06a	0.01a	6.5a	6.5a	90.8a	2.7a	7.5a	0.24b
T3: Low N, Medium Ca	0.63a	0.11a	1.28ab	0.23a	0.07a	0.02a	6.7a	5.0b	53.2b	4.8a	7.7a	0.36a
T4: High N, High Ca	0.67a	0.10ab	1.12b	0.17ab	0.05a	0.02a	6.2a	5.0b	47.0b	1.5a	8.5a	0.26ab

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 93. Pre-harvest Soil-External (Outside of the irrigation drip line) Analysis – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (June 14, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	6.2a[z]	15.5a	37.7a	0.94a	12.2a	3.3a	16.5a	5.0a	4.4a	213a	25.5a	0.30a	0.94a
T2: Higher N, Low Ca	5.9a	10.7a	37.2a	0.66ab	12.6a	33.9a	21.7a	4.4a	6.0a	165a	23.0a	0.30a	1.68a
T3: Low N, Medium Ca	5.9a	14.7a	22.5a	0.57b	12.5a	4.7a	17.8a	5.4a	5.8a	112a	33.7a	0.27a	0.87a
T4: High N, High Ca	6.2a	13.7a	25.7a	0.59a	11.5a	5.3a	11.2a	4.0a	9.1a	151a	28.3a	0.28a	0.97a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 94. Pre-harvest Soil-Internal (at the irrigation drip line) Analysis – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (June 14, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca	6.4ab[z]	20.2a	197a	0.81a	9.7a	4.0a	20.5a	22.5b	14.5a	278.5a	31.8a	0.25a	0.50a
T2: Higher N, Low Ca	6.0b	20.8a	214a	0.74a	8.5a	3.6a	20.0a	37.7a	15.7a	362.0a	35.5a	0.25a	0.46a
T3: Low N, Medium Ca	6.4ab	24.0a	175a	0.91a	10.9a	4.0a	24.5a	20.4b	20.5a	245.7a	31.0a	0.21a	0.54a
T4: High N, High Ca	6.6a	15.0a	165a	0.81a	9.8a	3.8a	19.3a	23.5ab	14.8a	248.0a	30.8a	0.25a	0.66a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 95. Pre-harvest Foliar Analysis – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (June 17, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.97a[z]	0.13a	1.03a	1.64a	0.22a	0.09a	10.7a	7.3a	36.7a	170.7a	35.0a	0.84a
T2: Higher N, Low Ca	1.93a	0.12a	1.32a	1.52a	0.19b	0.08a	11.5a	7.5a	41.2a	184.8a	39.8a	0.80a
T3: Low N, Medium Ca	1.85a	0.12a	1.15a	1.67a	0.21ab	0.09a	10.2a	8.5a	39.3a	183.0a	37.0a	0.90a
T4: High N, High Ca	1.93a	0.12a	1.14a	1.76a	0.21ab	0.08a	11.3a	7.7a	37.5a	188.7a	32.2a	0.92a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 96. Post-harvest Soil-External (Outside of the irrigation drip line) Analysis-Orchard 2, Ecuador, 'Ataulfo'-Third Year of Field Study (December 27, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Medium Ca		6.1a[z]	19.3a	47.7a	0.80a	8.8a	1.93a	20.3a	7.12a	5.4a	272a	26.5a	0.83a	0.48a
T2: Higher N, Low Ca		6.0a	16.2a	41.2a	0.76a	7.6a	2.15a	20.2a	9.10a	4.6a	287a	23.7a	0.82a	0.50a
T3: Low N, Medium Ca		5.8a	18.2a	45.7a	0.95a	8.4a	2.30a	19.3a	9.03a	4.9a	289a	26.7a	0.67a	0.47a
T4: High N, High Ca		6.0a	17.8a	44.2a	0.78a	6.5a	1.74a	19.8a	6.68a	4.9a	227a	22.8a	0.85a	0.38a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 97. Post-harvest Soil-Internal (at the irrigation drip line) Analysis – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (December 27, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$	
T1: High N, Medium Ca		6.33a[z]	20.0a	185a	0.78ab	9.4a	1.54a	23.2a	21.6a	9.4b	301.0a	23.0a	0.78a	0.51a
T2: Higher N, Low Ca		5.93b	13.7a	216a	0.64b	9.0a	1.86a	19.5a	30.6a	15.2ab	356.7a	26.5a	0.80a	0.84a
T3: Low N, Medium Ca		6.30ab	20.3a	188a	0.87a	11.1a	2.23a	29.5a	38.3a	20.9a	249.5a	26.3a	0.95a	0.56a
T4: High N, High Ca		6.18ab	16.3a	157a	0.70b	8.7a	1.65a	20.5a	35.3a	14.8ab	244.7a	22.5a	1.03a	0.58a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 98. Post-harvest Foliar Analysis – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (January 11, 2017).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	1.45a[z]	0.11a	0.70a	3.14a	2.4a	0.13a	39.5a	160.5a	186.8a	674.8a	147.8a	2.16a
T2: Higher N, Low Ca	1.53a	0.11a	0.77a	2.71b	0.11a	0.13a	33.0a	169.7a	213.0a	682.8a	156.0a	1.78b
T3: Low N, Medium Ca	1.53a	0.11a	0.76a	2.74b	0.12a	0.14a	32.0a	163.0a	208.3a	641.0a	140.8a	1.79b
T4: High N, High Ca	1.52a	0.15a	0.70a	2.88ab	0.11a	0.12a	30.0a	147.7a	205.7a	677.8a	164.0a	1.90b

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 99. First Fruit Analysis (average diameter fruit= 0.51 cm) – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (August 02, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	2.1a[z]	0.27a	1.30a	0.45a	0.15a	0.08a	29.5a	15.8a	101.0a	171.0a	16.2a	0.22a
T2: Higher N, Low Ca	1.98a	0.28a	1.28a	0.46a	0.16a	0.08a	32.0a	18.5a	166.5a	176.5a	19.7a	0.23a
T3: Low N, Medium Ca	1.98a	0.28a	1.35a	0.46a	0.17a	0.08a	32.0a	19.0a	157.7a	178.5a	17.0a	0.23a
T4: High N, High Ca	1.92a	0.28a	1.19a	0.44a	0.14a	0.08a	31.5a	18.0a	226.8a	147.5a	16.3a	0.23a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 100. Second Fruit Analysis (average diameter fruit= 1.80 cm) – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (August 27, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	0.68a[z]	0.08a	1.51a	0.16a	0.08a	0.04a	10.8a	5.0a	66.0a	25.2a	17.7a	0.35a
T2: Higher N, Low Ca	0.83a	0.10a	1.41a	0.35a	0.07a	0.05a	10.3a	5.5a	88.0a	27.0a	17.7a	0.42a
T3: Low N, Medium Ca	0.80a	0.10a	1.48a	0.20a	0.07a	0.06a	9.7a	5.7a	58.3a	24.0a	16.2a	0.25a
T4: High N, High Ca	0.68a	0.10a	1.47a	0.09a	0.07a	0.01a	9.5a	5.2a	94.5a	24.8a	18.7a	0.19a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 101. Third Fruit Analysis (average diameter fruit= 2.99 cm) – Orchard 2, Ecuador, 'Ataulfo' – Third Year of Field Study (September 15, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	B (mg/L)	Ca/N
T1: High N, Medium Ca	0.70a[z]	0.08a	1.49a	0.17a	0.09a	0.02a	7.8a	5.3a	58.2a	15.0a	10.5a	0.25a
T2: Higher N, Low Ca	0.68a	0.08a	1.37a	0.15a	0.06a	0.02a	7.2a	5.7a	46.2a	14.0a	10.5a	0.22a
T3: Low N, Medium Ca	0.67a	0.08a	1.44a	0.11a	0.06a	0.02a	7.8a	5.5a	53.3a	15.0a	11.3a	0.17a
T4: High N, High Ca	0.72a	0.08a	1.38a	0.13a	0.06a	0.02a	7.7a	4.8a	59.8a	14.8a	12.0a	0.20a

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Different letters within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 102. Pre-harvest Soil-Trench Analysis – Orchard 1, Peru, 'Kent' – Fourth Year of Field Study (June 15, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Low N, High Ca	7.7a[z]	2.2c	266.8a	0.30a	3.28a	1.07a	30.0a	19.2b	24.4a	51.4a	12.1ab	0.38b	1.54a
T2: Low N, Low Ca	7.9a	2.4c	190.2b	0.29a	2.62b	0.90b	28.0a	21.8b	10.1a	15.6a	7.8ab	0.47ab	1.14a
T3: High N, High Ca	7.9a	30.6b	197.8b	0.22a	3.74a	1.12a	22.4ab	58.6a	19.7a	35.2a	10.5ab	0.32b	0.12c
T4: High N, Low Ca	7.8a	34.4a	192.4b	0.20a	3.28a	1.04a	18.0b	47.9ab	26.2a	32.0a	15.0a	0.63a	0.09c

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca

[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 103. Pre-harvest Soil-Row Analysis – Orchard 1, Peru, 'Kent' – Fourth Year of Field Study (June 15, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: Low N, High Ca	7.8a$_z$	2.4c	182.4a	0.62b	3.48a	1.15a	48.0a	26.5a	37.3a	27.4a	11.4a	1.25a	1.52a
T2: Low N, Low Ca	7.9a	2.2c	202.6a	1.01a	2.48b	1.01a	50.4a	17.8ab	46.8a	16.4b	13.4a	1.05a	1.17a
T3: High N, High Ca	7.9a	14.4b	186.0a	0.98a	2.26b	0.96a	41.4a	7.9b	6.36a	12.2b	7.5a	0.94a	0.65b
T4: High N, Low Ca	8.1a	30.2a	215.0a	0.99a	2.46b	1.08a	49.4a	15.4ab	11.9a	18.4ab	23.4a	1.05a	0.08c

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 104. Pre-harvest Foliar Analysis – Orchard 1, Peru, 'Kent' – Fourth Year of Field Study (June 15, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	1.42a$_z$	0.17a	1.25a	2.18a	0.27a	0.25a	15.4ab	7.96a	198.0a	59.2a	165.8a	1.55a
T2: Low N, Low Ca	1.43a	0.16a	1.22a	2.74a	0.29a	0.25a	17.8a	7.50a	221.6a	38.0b	163.6a	1.94a
T3: High N, High Ca	1.46a	0.16a	1.29a	2.44a	0.26a	0.23a	16.0ab	7.64a	223.0a	49.6ab	162.0a	1.69a
T4: High N, Low Ca	1.51a	0.16a	1.36a	2.27a	0.23b	0.23a	10.8b	6.88a	192.8a	37.8b	169.2a	1.51a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 105. First Fruit Analysis (ave. diameter fruit= 0.6 cm) – Orchard 1, Peru, 'Kent' – Fourth Year of Field Study (November 18, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	0.50a[z]	0.13b	1.65a	1.05b	0.075c	0.33b	10.5a	9.7a	39.8a	7.3a	35.3a	1.3a
T2: Low N, Low Ca	0.71a	0.17ab	1.30b	1.05b	0.09c	0.34b	10.8a	7.5bc	38.2a	7.0a	48.6a	1.5a
T3: High N, High Ca	0.85a	0.18a	1.70a	1.19a	0.12b	0.38a	10.8a	9.4ab	48.4a	10.6a	54.4a	1.4a
T4: High N, Low Ca	0.79a	0.15ab	1.53ab	1.12ab	0.14a	0.37a	13.0a	7.0c	29.0a	8.0a	56.0a	1.4a

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 106. Second Fruit Analysis (ave. diameter fruit= 2.9 cm)-Orchard 1, Peru, 'Kent'-Fourth Year of Field Study (December 05, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: Low N, High Ca	0.25c[z]	0.16a	1.42a	0.18a	0.08bc	0.24a	19.2a	6.6a	41.4a	7.4a	46.0a	0.73a
T2: Low N, Low Ca	0.45ab	0.14a	1.43a	0.16a	0.07c	0.21a	17.4a	6.8a	32.4a	7.4a	43.2a	0.40b
T3: High N, High Ca	0.38b	0.15a	1.18a	0.10b	0.09ab	0.20a	8.8b	6.1a	37.4a	6.4a	52.4a	0.26b
T4: High N, Low Ca	0.47a	0.15a	1.28ab	0.12b	0.10a	0.21a	9.8b	7.4a	44.2a	8.0a	42.8a	0.24b

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 107. Pre-harvest Soil-Trench Analysis-Orchard 2, Peru, 'Kent'-Third Year of Data Collection on the Fourth Year of Field Study (June 15, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Low Ca	7.6a[z]	6.4b	35.6a	0.84a	17.3b	4.76c	191a	11.5a	3.64a	18.6a	13.8a	2.27ab	4.67b
T2: Higher N, Low Ca	7.6a	32.2a	25.2a	0.81a	80.1ab	4.97bc	339a	9.4a	2.64ab	18.8a	14.0a	1.99bc	2.55b
T3: Low N, High Ca	7.7a	32.6a	26.0a	0.83a	99.7a	4.95c	445a	8.6a	1.98b	11.6a	15.4a	1.93bc	3.27b
T4: High N, High Ca	7.6a	17.4b	20.2a	0.73a	86.7a	5.40a	175a	10.5a	2.10ab	9.6a	24.5a	1.73c	4.78b
T5: Low N, Low Ca	7.5a	11.6b	46.8a	0.86a	90.5a	5.33ab	191a	14.0a	3.06ab	8.0a	17.1a	2.57a	7.54a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 108. Pre-harvest Soil-Row Analysis – Orchard 2, Peru, 'Kent' – Third Year of Data Collection on the Fourth Year of Field Study (June 15, 2016).

Pre-harvest Treatment[y]	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
T1: High N, Low Ca	7.6a[z]	12.2ab	41.8a	0.92a	18.2b	5.0a	97.6b	19.8a	4.18a	21.2a	15.1ab	2.5a	2.43a
T2: Higher N, Low Ca	7.7a	22.2ab	24.2a	0.86a	45.5ab	4.7a	287.4a	11.2a	2.56b	10.6a	16.1ab	2.2a	2.17a
T3: Low N, High Ca	7.5a	24.4a	25.8a	0.83a	79.8a	5.1a	193.8ab	11.0a	2.12b	9.4a	14.7ab	1.8a	3.20a
T4: High N, High Ca	7.5a	13.0ab	54.8a	0.98a	66.9ab	5.2a	83.8b	11.8a	2.34b	23.8a	20.4a	2.3a	4.82a
T5: Low N, Low Ca	7.7a	10.0b	26.8a	0.83a	50.4ab	4.9a	106.8b	11.2a	2.34b	11.6a	9.9b	1.9a	4.86a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 109. Pre-harvest Foliar Analysis – Orchard 2, Peru, 'Kent' – Third Year of Data Collection on the Fourth Year of Field Study (June 15, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	1.24ab[z]	0.19a	1.19a	3.38a	0.22a	0.21b	37.0ab	6.5a	204a	130a	153b	2.79a
T2: Higher N, Low Ca	1.08b	0.18a	1.16a	3.29a	0.23a	0.23ab	40.4a	7.9a	201a	128a	160ab	3.05a
T3: Low N, High Ca	1.36a	0.17a	1.10a	3.19a	0.22a	0.23ab	40.8ab	6.0a	219a	122a	156ab	2.38a
T4: High N, High Ca	1.20ab	0.18a	1.06a	3.72a	0.22a	0.25a	20.0b	7.3a	222a	104a	161ab	3.16a
T5: Low N, Low Ca	1.36a	0.19a	1.06a	3.24a	0.21a	0.24ab	25.0ab	7.0a	238a	126a	162a	2.41a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 110. First Fruit Analysis (ave. diameter fruit= 0.6 cm) – Orchard 2, Peru, 'Kent' – Third Year of Data Collection on the Fourth Year of Field Study (August 11, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	2.38a[z]	0.28a	2.22a	0.90bc	0.32a	0.22a	33.4a	16.3a	25.4a	21.6a	26.0c	0.38c
T2: Higher N, Low Ca	2.13ab	0.29a	1.89ab	1.03a	0.28ab	0.21ab	24.4ab	16.7a	25.0a	19.2a	37.6b	0.49bc
T3: Low N, High Ca	1.68bc	0.21b	1.82abc	0.82c	0.22b	0.19b	22.0ab	15.6a	28.4a	18.0ab	39.2b	0.50bc
T4: High N, High Ca	0.98d	0.18b	1.18c	0.86bc	0.14c	0.15c	15.8b	7.6b	19.4a	8.6b	39.8b	1.02a
T5: Low N, Low Ca	1.37cd	0.15c	1.54bc	0.98ab	0.28ab	0.21ab	22.8ab	12.3ab	24.8a	17.6ab	48.6a	0.89ab

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 111. Second Fruit Analysis (ave. diameter fruit= 1.8 cm) – Orchard 2, Peru – Third Year of Data Collection on the Fourth Year of Field Study (August 27, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	2.00a[z]	0.21ab	2.44a	0.91a	0.30b	0.26b	20.6a	20.9a	34.0a	22.6a	42.6bc	0.48a
T2: Higher N, Low Ca	1.98a	0.22ab	2.37a	0.82a	0.35ab	0.26b	19.0a	17.3ab	26.6a	22.6a	58.4a	0.42a
T3: Low N, High Ca	2.10a	0.26ab	2.44a	0.83a	0.41a	0.31a	19.8a	19.4ab	37.4a	24.8a	50.6ab	0.40a
T4: High N, High Ca	2.11a	0.20b	2.29a	0.90a	0.33ab	0.30a	22.4a	19.2ab	35.6a	19.4a	37.6bc	0.43a
T5: Low N, Low Ca	2.26a	0.28a	2.27a	0.93a	0.31b	0.32a	20.2a	15.6b	33.4a	22.0a	35.0c	0.42a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 112. Third Fruit Analysis (ave. diameter fruit= 4.1 cm) – Orchard 2, Peru, 'Kent' – Third Year of Data Collection on the Fourth Year of Field Study (September 10, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	1.00a[z]	0.18a	2.46a	1.06a	0.09a	0.32ab	34.6a	11.4ab	37.8ab	9.8b	42.2b	1.14a
T2: Higher N, Low Ca	0.92a	0.15a	2.24a	0.91a	0.08a	0.31b	31.0a	9.9b	22.4b	8.0b	41.6b	1.03a
T3: Low N, High Ca	1.06a	0.19a	2.03a	0.94a	0.10a	0.33ab	19.0a	14.7a	26.0ab	9.6b	59.2a	0.92a
T4: High N, High Ca	1.07a	0.17a	2.03a	1.11a	0.08a	0.33ab	17.4a	12.3ab	43.2a	10.4ab	59.8a	1.04a
T5: Low N, Low Ca	1.11a	0.20a	1.83a	1.07a	0.10a	0.34a	28.4a	11.4ab	33.4ab	16.6a	49.8a	1.01a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences ($P \leq 0.05$) between means according to a Waller-Duncan K-ratio test.

Table 113. Fourth Fruit Analysis (ave. diameter fruit= 6.8 cm) – Orchard 2, Peru, 'Kent' – Third Year of Data Collection on the Fourth Year of Field Study (October 01, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	0.76a[z]	0.18ab	2.05a	1.05a	0.09a	0.28a	21.0a	10.7a	37.8a	7.0a	77.2a	1.39a
T2: Higher N, Low Ca	0.81a	0.18ab	1.89a	1.04a	0.07a	0.27a	8.4b	10.1a	117.6a	9.2a	65.0b	1.40a
T3: Low N, High Ca	0.76a	0.17ab	1.95a	0.96a	0.08a	0.28a	16.4ab	9.3a	32.4a	8.0a	63.2b	1.26a
T4: High N, High Ca	0.78a	0.19a	1.83a	1.15a	0.08a	0.29a	9.2b	9.2a	32.8a	9.2a	57.2b	1.47a
T5: Low N, Low Ca	0.65a	0.14b	1.90a	1.13a	0.07a	0.29a	14.4ab	8.9a	47.6a	9.8a	60.6b	1.77a

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 114. Fifth Fruit Analysis (ave. diameter fruit= 9.3 cm) – Orchard 2, Peru, 'Kent' – Third Year of Data Collection on the Fourth Year of Field Study (October 21, 2016).

Pre-harvest Treatment[y]	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)	B (ppm)	Ca/N
T1: High N, Low Ca	0.49a[z]	0.15a	1.26a	0.14bc	0.07bc	0.16a	8.4b	6.9a	55.0a	7.8a	59.0a	0.30b
T2: Higher N, Low Ca	0.32b	0.15a	1.22a	0.11d	0.08b	0.12b	8.4b	6.8a	87.6a	6.6ab	62.6a	0.36b
T3: Low N, High Ca	0.56a	0.13a	1.22a	0.16b	0.10a	0.15a	13.4a	5.9a	55.4a	5.2b	42.6b	0.30b
T4: High N, High Ca	0.35b	0.12a	1.14ab	0.24a	0.11a	0.14ab	11.8ab	5.2a	51.6a	6.0ab	56.2a	0.69a
T5: Low N, Low Ca	0.37b	0.14a	0.98b	0.12cd	0.06c	0.16a	10.0ab	5.1a	50.4a	5.0b	58.8a	0.33b

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N
[z] Different letter within columns indicate significant differences (P≤ 0.05) between means according to a Waller-Duncan K-ratio test.

Table 115. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 1, Peru – First Year of Field Study (2013-14).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: Low N, High Ca	0	0
T2: Low N, Low Ca	0	0
T3: High N, High Ca	0	0
T4: High N, Low Ca	0	0

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca

[z] Means are percentage of cutting dark for 15-20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 116. Percentage of *Corte Negro* in 'Tommy Atkins' Fruit – Orchard 1, Ecuador – First Year of Field Study (2014-15).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Medium Ca	0	5.0
T2: Higher N, Low Ca	15.0	5.0
T3: Low N, Medium Ca	20.0	25.0
T4: High N, High Ca	0	0

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Means are percentage of cutting dark for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 117. Percentage of *Corte Negro* in 'Ataulfo' Fruit – Orchard 2, Ecuador – First Year of Field Study (2014-15).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Medium Ca	0	5.0
T2: Higher N, Low Ca	0	5.0
T3: Low N, Medium Ca	0	10.0
T4: High N, High Ca	0	0

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Means are percentage of cutting dark for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 118. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 1, Peru – Second Year of Field Study (2014-15).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: Low N, High Ca	0	0
T2: Low N, Low Ca	--	0
T3: High N, High Ca	0	0
T4: High N, Low Ca	0	15.0

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca

[z] Means are percentage of cutting dark for 15-20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 119. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 2, Peru – First Year of Field Study (2014-15).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Low Ca	0	5.0
T2: Higher N, Low Ca	0	10.0
T3: Low N, High Ca	0	5.0
T4: High N, High Ca	0	0
T5: Low N, Low Ca	--	--

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N

[z] Means are percentage of cutting dark for 15-20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 120. Percentage of *Corte Negro* in 'Tommy Atkins' Fruit – Orchard 1, Ecuador – Second Year of Field Study (2015-16).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Medium Ca	3.7	7.7
T2: Higher N, Low Ca	6.6	2.5
T3: Low N, Medium Ca	5.3	3.9
T4: High N, High Ca	5.5	5

[y] T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Means are percentage of cutting dark for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 121. Percentage of *Corte Negro* in 'Ataulfo' Fruit – Orchard 2, Ecuador – Second Year of Field Study (2015-16).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Medium Ca	0	15.8
T2: Higher N, Low Ca	0	7.5
T3: Low N, Medium Ca	0	5
T4: High N, High Ca	0	16.5

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca
[z] Means are percentage of cutting dark for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 122. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 1, Peru – Third Year of Field Study (2015-16).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: Low N, High Ca	0	0
T2: Low N, Low Ca	0	4.7
T3: High N, High Ca	0	3.7
T4: High N, Low Ca	0	6.1

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca
[z] Means are percentage of cutting dark for 15-20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 123. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 2, Peru – Second Year of Field Study (2015-16).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Low Ca	0	0
T2: Higher N, Low Ca	0	0
T3: Low N, High Ca	0	2
T4: High N, High Ca	0	3.1
T5: Low N, Low Ca	0	7.1

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N

[z] Means are percentage of cutting dark for 15-20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 124. Percentage of Corte Negro in 'Tommy Atkins' Fruit – Orchard 1, Ecuador – Third Year of Field Study (2016-17).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Medium Ca	0	0
T2: Higher N, Low Ca	0	0
T3: Low N, Medium Ca	0.83	0
T4: High N, High Ca	0.83	0

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Means are percentage of cutting dark for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 125. Percentage of Corte Negro in 'Ataulfo' Fruit - Orchard 2, Ecuador – Third Year of Field Study (2016-17).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Medium Ca	0	100
T2: Higher N, Low Ca	0	97.9
T3: Low N, Medium Ca	0	98.3
T4: High N, High Ca	0	98.3

[y]T1: standard grower practice, T2: increased N, stopped Ca, T3: decreased N, T4: increased Ca

[z] Means are percentage of cutting dark for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 126. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 1, Peru – Fourth Year of Field Study (2016-17).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: Low N, High Ca	0	0
T2: Low N, Low Ca	0	1.9
T3: High N, High Ca	0	2.8
T4: High N, Low Ca	0	0

[y]T1: standard grower practice, T2: decreased Ca, T3: increased N, T4: increased N and decreased Ca

[z] Means are percentage of cutting black for 15-20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 127. Percentage of *Corte Negro* in 'Kent' Fruit – Orchard 2, Peru – Third Year of Field Study (2016-17).

	Post-harvest treatment	
Pre-harvest treatment[y]	T1: Ambient temperature storage[z]	T2: Cold temperature storage
T1: High N, Low Ca	0	1
T2: Higher N, Low Ca	0	1
T3: Low N, High Ca	0	1
T4: High N, High Ca	0	1
T5: Low N, Low Ca	0	1

[y] T1: standard grower practice, T2: increased N, T3: decreased N and increased Ca, T4: increased Ca, T5: decreased N

[z] Means are percentage of cutting black for 20 fruit per replication. There were no significant treatment differences ($P \leq 0.05$) among pre-harvest treatments within each postharvest treatment or among post-harvest treatments within each pre-harvest treatment according to a Waller-Duncan K ratio test. Data were transformed with an arcsine transformation for mean comparisons.

Table 128. Soil analysis average from Orchard 3, Peru (traceback study, January 18, 2017).

Farm name	pH	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N $\left(\frac{meq/100cm^3}{\mu g/cm^3}\right)$
Cambio Cora (‘Ataulfo’)	7.2	7	70	0.79	14.1	4.89	418	8.0	7.3	24	11.8	1.67	1.9
Viña (‘Ataulfo’)	7.2	6	77	0.51	12.0	4.22	130	10.2	18.4	31	16.3	3.58	2.1
Viña Experimental (‘Ataulfo’)	7.0	4	72	0.57	10.8	3.64	100	14.6	6.3	49	13.9	1.20	2.7
Viña experimental (‘Kent’)	6.8	4	72	0.33	9.5	3.27	39	20.9	5.0	53	20.5	0.82	2.2
Huabo (‘Kent’)	7.8	6	34	0.65	16.6	5.24	170	19.5	10.3	12	12.7	2.08	2.9

Table 129. Foliar analysis average from Orchard 3, Peru (traceback study, January 18, 2017).

Farm name	N $\left(\frac{\mu g}{cm^3}\right)$	P $\left(\frac{\mu g}{cm^3}\right)$	K $\left(\frac{meq}{100cm^3}\right)$	Ca $\left(\frac{meq}{100cm^3}\right)$	Mg $\left(\frac{meq}{100cm^3}\right)$	S $\left(\frac{\mu g}{cm^3}\right)$	Zn $\left(\frac{\mu g}{cm^3}\right)$	Cu $\left(\frac{\mu g}{cm^3}\right)$	Fe $\left(\frac{\mu g}{cm^3}\right)$	Mn $\left(\frac{\mu g}{cm^3}\right)$	B $\left(\frac{\mu g}{cm^3}\right)$	Ca/N
Cambio Cora (‘Ataulfo’)	1.27	0.16	0.98	1.69	0.19	0.25	23	2.3	100	25	145	11
Viña (‘Ataulfo’)	0.98	0.13	0.85	3.14	0.25	0.23	30	11.2	184	47	170	25
Viña Experimental (‘Ataulfo’)	1.43	0.13	0.79	3.56	0.25	0.26	26	1.0	153	186	129	27
Viña experimental (‘Kent’)	1.33	0.14	0.70	3.59	0.21	0.25	19	1.6	119	57	118	26
Huabo (‘Kent’)	1.07	0.11	0.82	2.35	0.26	0.23	19	5.5	86	15	130	21

Table 130. Percentage of Harvested (mature) 'Ataulfo' fruit per tree with *Corte Negro* at Orchard 3 (Viña Farm), Peru (traceback study, December 24, 2016).

Stage of fruit maturity	% *Corte negro*
1	66.3b[z]
2	87.8a
3	80.3ab

[z]Different letters indicate significant differences among stages of fruit maturity according to Waller's HSD Test ($P \leq 0.05$).