Almond Harvest 2017, Stevinson Home Ranch 7 Area Test of PNTI Products

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SUMMARY, SECTION !: The 2017 total almond harvest (combined 05Sep Non-Pareil and 23Oct Monterey) from Stevinson HR7 trees treated with PNTI fertilizers yielded an average of **2107** lbs meats per acre, a **75%** improvement over the total HR7 yield of **1202** lbs meats per acre for year 2016.

SUMMARY, SECTION 2: Tree leaf and meats nutrient levels and average almond weight in PNTI-treated color-coded HR7 areas closely match those from a conventionally fertilized Stevinson HR6 area.

1.0 INTRODUCTION: A seven acre area of Stevinson Ranch almond trees was dedicated to testing PNTI fertilizer products. Identified as Home Ranch 7 (HR7), the area was first fertilized in October 2016 with a mixture of PNTI products PoweRoc, BioRoc and RocTea. For a second fertilization, in February 2017, the area was divided into five equal-size 1.4 acre regions, each receiving a different combination of PNTI products. Color-tagged trees identified the type of treatment applied in each of the five regions. During the PNTI fertilizer test period, no other type of fertilizer was added to the five test regions. PNTI test regions received only water on the same watering schedule as the main Stevinson almond orchard.

Non-Pareil variety (NP) almonds growing in the test regions were harvested on 05Sep2017. Monterey variety almonds were harvested on 23Oct2017. Field weights were determined from net cart weights of harvested almonds. Total field weight for each color-coded area (shown in Table 1.1) is the combination of weights from the 05Sep Non-Pareil and 23Oct Monterey harvests. Samples were also obtained from each region for laboratory measurement of weights of husk, shell and meats in order to estimate the "crack-out" (percentage of meats weight yielded from field weight).

1.1 METHOD AND RESULTS: Field weight data are summarized in Table 1.1 together with the calculated Meats,lbs/acre for each color region, determined from application of the also listed laboratory-measured "crack-out" percentages to field weight data. In Table 1.1, Color identifies regions of the second fertilization (Feb 2017); Field Weight is total measured weight minus empty cart weight in pound units as measured with a calibrated set of Intercomp Corp. Model PT300 portable electronic scales ; Area is 1.4 acres for each HR7 color region; Crack Out, Meats Weight per Field Weight , is estimated from laboratory measurements of field samples taken from each color region at Non-Pareil and Monterey harvests. Weights of husks, shells and meats were measured for each sample to yield a Crack Out percentage and thus estimate Meats weight from actual field weights. Table 1.1 also shows an estimate of Meats, lbs/acre. More detail is given below in Section 1.2 titled "**sample weigh procedure"**. Table 1.2 describes the treatment given to each color-coded area in HR7 during the second fertilization (Feb 2017).

Table 1.1 indicates a year 2017 total HR7 harvest average yield of **2107** Meats, lbs/acre, a **75 %** improvement over the 1202 lbs/acre obtained for the year 2016. It is noted that the year 2017 average yield of **2107** is quite close to the Meats values for the previous years 2013 and 2014.

Table 1.1

HR7-PNTI 2017 Almond Harvests,Non-Pareil (NP) and Monterey (M)
Field Weight, lbs and Meats, lbs per acre

Color	Harvest Variety	Field weight lbs	Crack Out Wt. Meats/Field Wt. percent	Meats lbs	MEATS/ACRE lbs/acre
RED	NP	9930	23.0	2284	
	M	4260	27.6	1176	
	TOTAL	14,190		3460	**2471**
GREEN	NP	8190	20.2	1654	
	M	4060	27.4	1112	
	TOTAL	12,250		2766	**1976**
BLUE	NP	6360	24.2	1539	
	M	6650	28.3	1882	
	TOTAL	13,010		3421	**2443**
PURPLE	NP	4050	18.0	729	
	M	3340	29.3	979	
	TOTAL	7,390		1708	**1220**
YE**LLOW**	NP	4490	21.9	983	
	M	8890	27.1	2409	
	TOTAL	13,380		3392	**2423**

HR7 AVERAGE MEATS , LBS/ACRE **2107**

Table 1.2

Color-coded Area Fertilization Treatments, HR7, Feb2017

COLOR	TREATMENT
RED	First fertilization (Oct 2016) only; no second fertilization
YELLOW	First fertilization only plus disk and harrow row vegetation; no second fertilization
GREEN	Added two (2) tons per acre of PNTI Almond Blend (PoweRoc/BioRoc) mixture plus disk and harrow row vegetation.
BLUE	Disk and harrow row vegetation; applied 75 gallons RocTea
PURPLE	Disk and harrow row vegetation; applied two(2) tons per acre Almond Blend plus 75 gallons RocTea

1.2 SAMPLE WEIGH PROCEDURE

In order to correlate field weight with meats per acre, an estimate of "crack-out" percentage was obtained experimentally by weighing meats taken from small field samples, randomly selected from the harvests in each HR7 color-coded test region and also from a reference sample from HR6 trees growing near the HR7 acres.

Each small field sample weighed from 450 to 600 grams and contained mostly shells in husks plus some empty husks and some meats in shell. Stones and twigs were picked out before weighing. Meats were manually de-husked, de-shelled, counted and weighed on a laboratory scale accurate to ± 0. 05 gram. Empty husks and empty shells were collected and weighed together with Meats for a double check of total sample field weight. The ratio of Meats weight to field weight is listed in Table 1.1 as a percentage and was used in Table 1.1 to estimate "crack-out" weight of Meats (in units of pounds per acre) obtainable from actual harvest field weight (pounds).

All shells and meats from the small test samples taken from Non-Pareil and Monterey harvests were examined for defects. Any obviously defective meats and shells were rejected from the count. Defects included meats with frass trails, withered meats and from shells with worm holes. Double meats in one shell were included in the count as one meat. In general, defects amounted to about 5 percent or less of the total meats examined. As an example, the NP small sample from the GREEN area was de-husked and de-shelled with a yield of 111 good meats and 6 rejects including one with a frass trail. The total weight of good meats was 116.5 gram so that the average weight of a good meat was (116.5)/(111) = **1.05** gram per almond. Total weight of empty husks plus empty shells plus meats was 577.2 gram so that the "crack-out" percentage of Meats is estimated as **20.2 %** of field weight. The "crack-out" percentage determined in a similar manner for the GREEN Monterey small sample was **27.4 %.** As shown in Table 1.1, individual percentages were applied in calculating yield from field weight for each color test area for NP and Monterey harvests. The overall average value is **24.7 %** .

2.0 ADDITIONAL RELATED MEASUREMENTS

In addition to "crack out" measurements described in Section 1, separate metrics also obtained for the HR7-PNTI test regions show a close match between nutrient levels in meats and tree leaves for the PNTI fertilization treatment regions as compared with conventionally fertilized Stevinson Ranch orchards. The metrics are
(Section 2.1) assay of nutrient chemistry in samples from the NP harvest;
(Section 2.2) assay of tree leaf nitrogen and other nutrient levels in the test regions.
(Section 2.3) A third metric is the average weight of almonds in each test region for both NP and Monterey harvests; data obtained in Section 1.1 weight measurements.
The almond nutrient assay and tree leaf assay were determined at accredited independent laboratories. A brief account of the measurement methods and results follows.

2.1 NUTRIENT LEVELS, MEATS

Nutrient levels in HR7 PNTI-treated Non-Pareil meats match nutrient levels in conventionally fertilized Stevinson HR6 orchard almonds. To compare nutrient levels, meats from two HR7 and one HR6 NP harvest field samples were finely divided by grinding and then dissolved in acid for element analysis by inductively coupled plasma optical emission spectroscopy (ICP-OES) at Soil Control Laboratories, Watsonville CA. Table 2.1 shows nutrient element concentrations in NP meats from the PNTI fertilized RED and PURPLE HR7 zones and in NP meats from the conventionally fertilized WHITE HR6 zone. For comparison, Table 2.1 also includes nutrient levels for natural almonds listed in USDA publication SR25 Nutrient Data Base No. 12061. All concentrations are in units of parts per million (ppm).

Table 2.1

Non-Pareil Meats Nutrient Element Concentrations, ppm

Element	RED,HR7	PURPLE,HR7	WHITE,HR6	USDA SR25
Calcium	2400	2600	3600	2640
Iron	67	69	69	37
Magnesium	3000	3100	3100	2600
Phosphorous	5234	5239	5676	4840
Potassium	7600	7300	7800	7050
Sodium	-	-	-	10
Zinc	32	34	28	31
Copper	18	15	14	10
Manganese	24	24	24	22

As shown in Table 2.1, nutrient concentrations in PNTI-treated RED and PURPLE HR7 area Non-Pareil meats agree well (except for Calcium) with nutrient levels in the WHITE HR6 area which received conventional

fertilization. In general, nutrient levels in the PNTI-treated HR7 areas match USDA SR25 levels and are at measurably greater levels for Iron, Magnesium and Phosphorous.

2.2 NUTRIENT LEVELS, LEAVES

A check of crop quality before harvest time is customarily provided by analysis of leaf nutrient chemistry. Leaf nutrient data shown in Table 2.2 are extracted from Report 43995 for HR7 trees and Report 43996 for HR6 trees. HR6 data was chosen for comparison since the HR6 area received conventional watering and fertilization and is adjacent to HR7 area treated only with PNTI fertilizers and water. Both reports are dated 17July 2017 and were provided to Stevinson Ranch by Stanislaus Farm Supply, Modesto, CA (analyses determined by A&L Western Laboratories). The normal range is included in Table 2.2 for comparison with HR7 and HR6 leaf nutrient levels.

Table 2.2

LEAF NUTRIENTS (17July2017), percent

ELEMENT	NORMAL RANGE	HR7	HR6
Nitrogen	2.2--2.5	2.22	2.73
Sulfur	0.1—0.4	0.17	0.18
Phosphorus	0.11--0.3	0.15	0.17
Potassium	1.4--2.5	1.5	1.94
Magnesium	0.25--1.0	0.67	0.53
Calcium	2.0--2.4	3.11	1.85
Sodium	0.01--0.09	0.04	0.02

As shown in Table 2.2, all leaf nutrients for HR7 trees are within the normal range except for above-normal Calcium at 3.11 % which is in contrast to below-normal HR6 Calcium at 1.85%. Leaf Nitrogen serves as an important indicator of tree health and is within normal range for HR7 although no nitrogen compounds were added to the HR7 color-coded test areas by any of the three PNTI fertilizer products PoweRoc, BioRoc or RocTea.

Tree leaf nutrient assays reported on 15May2017 (HR7 Report 42059, HR6 Report 42058) were all within the normal range, similar to the 17July2017 levels listed in Table 2.2 . HR7 Nitrogen in May was at 3.07 %, well within a 2.8—3.8 % normal range. As noted in Section 1 of this report, harvested meats were abundant in HR7 test areas with July leaf Nitrogen at 2.22 %. Recalling that no Nitrogen compounds are added to PNTI fertilizers, natural Nitrogen fixation aided by root region bacteria and PNTI Roc chemistry may play a role in maintaining HR7 at an adequate Nitrogen level. In conventionally fertilized HR6, above-normal Nitrogen in HR6 leaves (at 3.81 % in May and 2.73 % in July) may indicate excess dosage.

2.3 AVERAGE ALMOND WEIGHT

Average meat weight was determined from weight of shelled NP and Monterey meats for each color-coded HR7 area . WHITE meats from the adjacent HR6 area are included for reference. As mentioned in Section 1.1, shelled meats were counted and weighed. Meats counted for each color-coded area numbered between 100 and 150. Double meats were counted as a single meat; broken meats were matched and combined to be counted as a single meat. Based on multiple measurements of selected samples , each average weight can be considered to have an uncertainty of about ± 0.15 gram. In the weight data shown in Table 2.3, no significant difference can be discerned between the average almond meat weight for HR7 color-coded areas as compared with WHITE HR6 conventionally fertilized almonds. Likewise, weights are similar for all color-coded areas, for both NP and Monterey varieties.

Table 2.3

AVERAGE ALMOND WEIGHT, grams

HR7 AREA COLOR	Non-Pareil	Monterey
RED	1.12	1.19
YELLOW	0.95	1.20
GREEN	1.05	1.04
BLUE	1.04	1.01
PURPLE	1.19	1.18
(HR6)WHITE	0.95	1.27