

Annual Report 1975

Almond Industry Research Project

TITLE : Project 75-A1 - Navel Orangeworm Research - Ballico-Famoso Project

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I. OBJECTIVES AND GOALS: Investigate the effectiveness and practicability of an integrated pest management program for suppressing navel orangeworm populations in almond orchards by means of orchard sanitation, early and rapid harvest, and insecticidal control of the peach twig borer. The program involves a 9 mi<sup>2</sup> test area plus a 9 mi<sup>2</sup> check area in Merced County and a 380 acre test area plus a 440 acre check area in Kern County. The Merced County test involves 47 growers with 2000 acres of almonds. The Kern County test involves one grower and a solid block of almonds. The three year program will cover the 1975, 1976 and 1977 crop years.

II. ABSTRACT: Residual fruits on hosts such as almonds, walnuts, peaches, plums and various "backyard" plants were removed from trees during December and January by mechanical and hand labor operations. Peach twig borer sprays were applied by the growers at the grower's expense during the dormant season. Early and rapid harvest was encouraged where possible.

A thorough job of orchard sanitation was accomplished in Merced County. The limited amount of data available at this time show rejects in the test area to be 2.2% for Nonpareil,

check are 3.6, 6.4 and 4.5%. In the years 1971-1974 the test always had higher rejects than did the check.

The Kern County sanitation program was less than desirable. However, navel orangeworm rejects in the test were 4.0% for Nonpareil and 2.2% for Merced, and comparable data for the check were 6.9 and 11.7%. This yielded a net profit of \$61 per acre or \$23,000 for the 380-acre block after deducting \$15 per acre for the winter sanitation costs.

III. EXPERIMENTAL PROCEDURE: The 380-acre block of almonds at Famoso, Kern County, was cleaned by shaking mummy nuts from the trees with four shakers operated by the cooperator during December. Nonpareils, Merceds, and Daveys were shook but Missions were not shook. A dormant spray for PTB control was applied during the dormant period.

Moth populations were monitored from early March through late October by use of blacklight traps for NOW and pheromone traps for PTB. The cooperator did most of the trapping work. A series of nut samples was taken by the researcher to check the rate of increase of insect damage in hulls and meats from hull split to harvest. Twenty sample sites were selected in the test and twenty in the check from which 100 Nonpareil nuts per site were taken on each of three dates (July 29, Aug. 12, Aug. 25). Fifteen sample sites were selected in the test and fifteen in the check from which 100 Merced nuts per site were taken on each of three dates (Aug. 25, Sept. 10, Sept. 23).

The following samples were taken to represent the damage at harvest as it was doubtful that duplicate nut samples could be obtained from the handlers that would be known to represent the test and check areas. One pound sub-samples from each of the samples were tested by the California Almond Growers Exchange test room. On Sept. 5, 95 Nonpareil samples from test and 110 from check - on Oct. 6, 19 Merced and 19 Davey samples from test and 15 Merced and 20 Davey samples from check. The actual Nonpareil harvest period extended beyond Sept. 12 and the actual Merced harvest period ended on Oct. 8.

The 2000 acres of almonds in the Ballico test, Merced County, were cleaned either by one of six trunk shakers or a 25 man handcrew. The handcrew cleaned small trees less than six years of age and orchards where the grower would not permit trunk shakers. Some of these growers were afraid of bark damage but most were afraid that the trees would be loosened from the ground and either fall or blow down. All varieties other than Missions were cleaned. This work was closely supervised by the researchers, and a much more thorough cleanup was achieved here than in the Famoso work. All but two growers put on a dormant spray including a phosphate (parathion, Diazinon, or Imidan) at their own expense and under their own supervision.

Three orchards in the test and three in the check that either had a history of high rejects or were suspected of having the potential for high rejects in 1975 were selected as trap sites for monitoring NOW and PTB populations. A series of nut samples was taken to check the rate of increase of insect damage in hulls and meats from hull split to harvest. Fifteen test area orchards with five sample sites in each and three check area orchards with five sample sites in each were selected from which 100 Nonpareil nuts per site were taken on each of three dates (Aug. 6, Aug. 19, Sept. 2). Neplus, Merced and Thompson varieties were also sampled from a few orchards on three dates (Sept. 2, Sept. 16, Sept. 30). The main evaluation of the effectiveness of the Ballico project will be made from the CAGE retest of the duplicate nut samples taken by handlers from deliveries of all growers in the test and

IV. RESULTS AND DISCUSSION: Mummy nut counts for the Ballico and Famoso tests are shown in Table 3. The well supervised work in Ballico yielded a much cleaner area than what was obtained in Famoso with a more commercial type operation. The check area in Ballico was also much cleaner than the check area in Famoso due to better harvest operations in many of the Ballico orchards and more natural cleanup from wind, rain and birds. The Ballico area orchards are mostly small orchards interspersed with other crops. This situation generally results in more bird activity than one would find in large solid plantings of almonds.

Blacklight trap catches (Fig. 2) show that NOW populations were suppressed in the Famoso test area up through early August, accumulative trap catches of 440 in test and 1750 in check (1:4 ratio), but that the populations in both areas increased rapidly during the rest of the season so that the final ratio for the test and check was 1:2.

Blacklight trap catches (Fig. 3) show suppression of NOW populations in the Ballico test area up through late August, accumulative trap catches of 30 in test and 220 in check (1:7 ratio). The NOW populations then increased rapidly, but the final ratio for the test and check was still a healthy 1:6. One of the three test area orchards used as a trap site was a problem orchard as the Mission variety (not cleaned in the winter cleanup) was a soft

One of the three check area orchards used as a trap site was cleaned by the grower resulting in low trap catches and only 0.2% NOW damage in our Sept. 2 nut samples.

A cost analysis for orchard sanitation (Table 6) for the Famoso orchard was developed as all the data were available for the 1975 crop. Tables 3 and 6 show that NOW damage for all varieties was lower in the test than in the check - 42% lower for Nonpareil, 82% lower for Merced and 49% lower for Davey. Table 6 shows that in blocks containing a 2:1 planting of Nonpareil, Merced, Mission, the net profit due to orchard sanitation was \$61 per acre or \$23,000 for the 380 acres in the test area.

Tables 3 and 7 show rejects for the Nonpareil, Neplus and Merced varieties to be lower in the test area than in the check area. Reject figures have been higher in the test than in the check for the 1971-1974 crop years. The data for Ballico in Tables 3 and 7 are based on preliminary and incomplete data for the 1975 crop, so little discussion is warranted.

Fig. 4 was prepared to show the production and the total reject dollar loss per acre for all varieties and the percent total rejects for Nonpareil for one grower in the Ballico test area and one grower in the check area. The dollar loss per acre was about equal for 1973-1975 for the check area grower, \$57-62. The test area grower had \$33 and \$35 losses

be \$26, \$12 in rejects and \$14 in orchard sanitation costs. The two growers had a somewhat similar pattern for percent rejects in the Nonpareil variety until 1975 when the check area grower had 5.2% and the test area grower had 1.9%.

Costs of orchard cleanup generally were \$3-14/acre for hand poling 3-6 year old trees, \$15-30/acre for hand poling 10-30 year old trees and \$13-25/acre for trunk shaking. Trunk shaking costs can be higher if much scaffolding is required or if there is no Mission variety present in the planting or if the Mission variety is a soft shell type infested by NOW.

- V. CONCLUSIONS AND RECOMMENDATIONS: Previous observations showing that mummy almonds come off the trees much better in foggy weather in both hand and mechanical cleaning were confirmed during this year's work. Dense fog or drizzle that wet the trees thoroughly are needed to give adequate removal of nuts from all varieties. Nonpareil in some orchards may be worked under less than ideal conditions. This is a factor that limits the use of orchard sanitation in some areas of the state and in some years when foggy and rainy weather do not remain for a long period of time in December and January. Plans are being made to test the use of solid set sprinkler systems and conventional spraying equipment to generate enough moisture on the trees so that shaking may be accomplished effectively.

The Ballico test area has been increased in size from 9 miles<sup>2</sup> with 47 growers and 2000 acres of almonds to 15 miles<sup>2</sup> with 61 growers and 2600 acres of almonds for the 1976 and 1977 seasons. This expansion gives much better boundaries on the south and east with more isolation from other almond growing areas.

The effectiveness and economic feasibility of cleaning mummy nuts from almond trees in a given orchard hinge on several variables that affect a decision on using hand poling or mechanical shaking. These are weather, locale, age of trees, variety, number of mummy nuts in trees, availability of good field crew supervision, availability of good equipment operators, whether or not trees are shaped for trunk shakers, and amount and type of bird activity that is generally present in the area.

DORMANT TREE SHAKING  
NONPAREIL VARIETY

Effects of dormant tree shaking on crop production.

Date of Shaking	Net Meat wt. (lbs. per tree)	% increase (+) or decrease (-) in crop size over check	Nut meats per ounce
Check	39.89	--	21.6
12-11-74	38.06	-4.6	20.8
1-6-75	45.14	+13.2	21.4
1-18-75	41.77	+4.7	21.3
1-31-75	37.31	-6.5	21.5
Averages	40.57	+1.7	--

Table 2

DORMANT TREE SHAKING  
MERCED VARIETY

Effects of dormant tree shaking on crop production.

Date of Shaking	Net Meat wt. (lbs. per tree)	% increase (+) or decrease (-) in crop size over check	Nut meats per ounce
Check	37.45	--	25.1
12-11-74	37.37	-0.2	25.3
1-6-75	41.01	+9.5	25.6
1-18-75	38.41	+2.6	25.1
1-31-75	37.40	-0.1	25.1
Averages	38.55	+2.6	25.3

ORCHARD SANITATION

Comparisons of 1975-crop data for cleaned orchards in Chico (individual grower's 40-acre test orchard), Famoso (corporation's 380-acre test orchard) and Ballico (47 growers with a total of 2000 acres).

	Ballico		Famoso		Chico	
	Test	Check	Test	Check	Test	Check
<u>Mummy Nuts Per Tree</u>						
Nonpareil	1.6	22	30	268	9	116
Neplus	0.7	16	--	---	10	11
Merced	3.4	34	11	116	--	--
Thompson	2.8	21	--	---	--	--
Davey	17.4	1	163	723	--	--
Drake	17.9	275	--	---	11	--
Mission	33.2	49	248	245	Few	Many
<u>Blacklight Trap Catches</u>						
Accumulative Avg.	296	1750	3048	5979	2019	1634
Peak Week	80	450	796	1102	486	380
<u>NOW Rejects (% of Meat Weight)</u>						
Nonpareil	2.2	3.6	4.00	6.89	3.33	7.01
Neplus	1.3	4.5	--	--	3.54	3.73
Merced	3.4	6.4	2.15	11.72	--	--
Davey	--	--	2.57	5.03		

ORCHARD SANITATION - SMALL BLOCK

Effects of dormant tree shaking on rejects and dollar loss per acre for subsequent Nonpareil crop, Chico, 1975.

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	<u>Meat Pounds per acre (Actual)</u>	<u>% Total Rejects</u>	<u>\$ Loss Per Acre*</u>
Cleaned (Test)	1446	3.33	36.00
Noncleaned (Check)	815	7.01	42.75
Noncleaned**	1473	4.75	52.50

If production had been the same in all 3 orchards:

Cleaned (Test)	1000	3.33	24.98
Noncleaned (Check)	1000	7.01	52.58
Noncleaned **	1000	4.75	35.62

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\*Nonpareil meat value at \$0.75/lb. plus 1/4¢/lb. service charge for each % damage over 3%.

\*\*Another orchard owned by same grower, but 1.25 miles east of the test and check orchards.

Comparisons of production per acre with percent rejects for several growers, Chico, 1975.

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<u>Orchard Identification</u>	<u>Tons Per Acre</u>	<u>% Rejects</u>
1	0.22	4.68
2	0.32	10.78
3	0.36	5.26
4	0.43	5.13
5	0.46	9.03
6	0.54	3.88
7	0.55	6.63
8*	0.58	7.01
9	0.63	7.96
10	0.77	8.91
11	0.79	6.00
12	0.86	7.11
13	0.89	7.87
14**	1.07	3.33

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\*Cooperator's check orchard.

\*\*Cooperator's test orchard.

COST ANALYSIS OF ORCHARD SANITATION  
FOR CONTROL OF THE NAVEL ORANGE-  
WORM (NOW) IN ALMONDS - FAMOSO - 1975

	DOLLARS/ACRE
Gross savings	76
Dormant tree shaking costs	-15
Net Savings	61

This yields a net savings of \$23, 000 for the 380 acres  
in the test area.

	POUNDS/ACRE
Nonpareil (66% of planting)	1450
Merced (17% of planting)	375
Mission (17% of planting)	375
Total production	2200

	% Meat Damage Due to NOW		Dollar Loss* per acre due to NOW damaged meats plus reject service charge (S/C)	
	Test	Check	Test	Check
Nonpareil	4.00	6.89	43.50 3.62(S/C)	74.93 14.50(S/C)
Merced	2.15	11.72	5.72 0 (S/C)	31.20 8.44(S/C)
Totals			52.84	129.07

\*Based on 75¢ /lb. for Nonpareil and 71¢ /lb.  
for Merced.

## BALLICO PROJECT

Effects of orchard sanitation - comparison of test area (1975) with prior year and check area. Total reject data available for only a few orchards in test and check.

	TEST		
	Base Year 1974	Test Year 1975	Increase or (Decrease)
Nonpareil	3.1%	2.2%	-29%
Merced	7.0%	3.4%	-51%
Neplus	3.2%	1.3%	-59%
	CHECK		
	Base Year 1974	Test Year 1975	Increase or (Decrease)
Nonpareil	2.9%	3.6%	+24%
Merced	7.9%	6.4%	-19%
Neplus	3.6%	4.5%	+25%

CHICO - 1975

●—● CHECK

X—X TEST

20

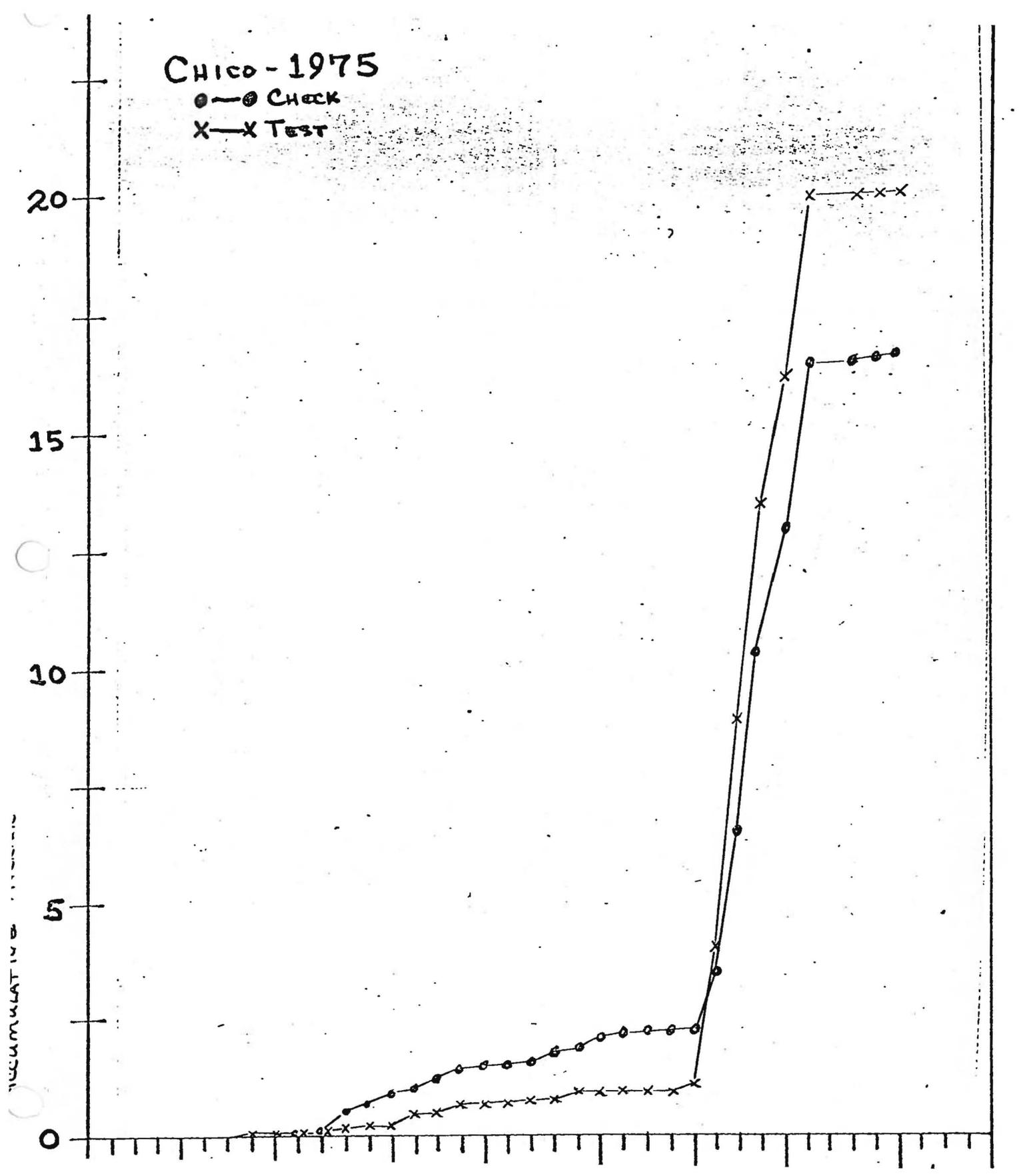
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ACCUMULATED



Famoso-1975

●—● CHECK

X—X TEST

ACCUMULATIVE AVERAGE WEEKLY NEW CATCHES IN BLACK LIGHT TRAPS X 1000



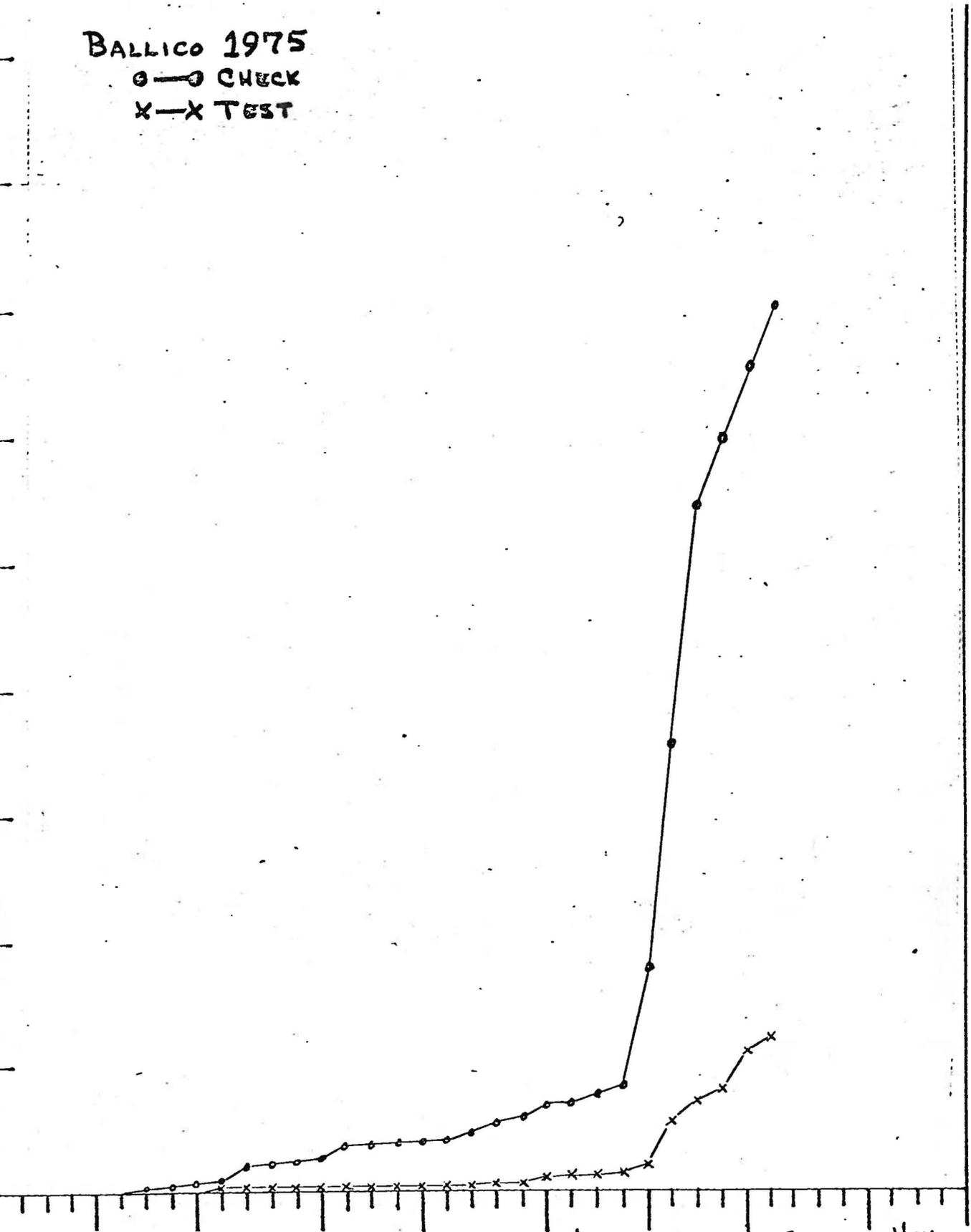
BALLICO 1975

○—○ CHECK

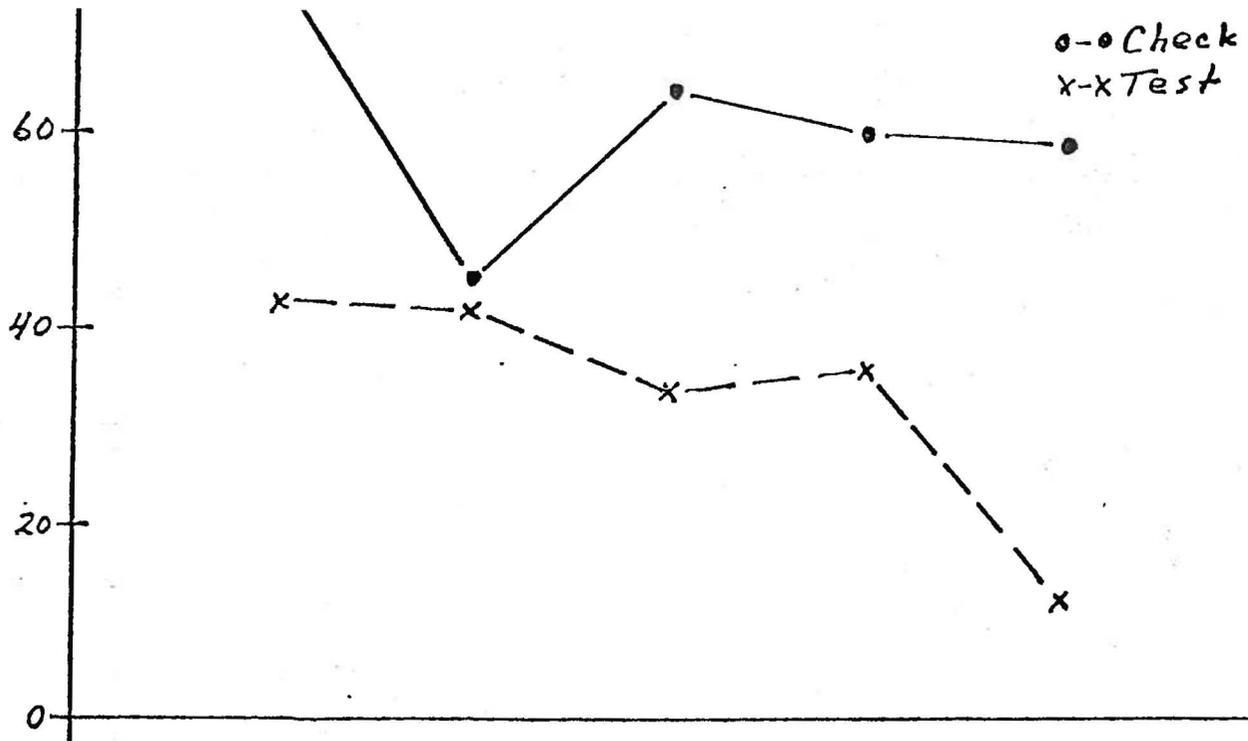
x—x TEST

ACCUMULATIVE AVERAGE WHEELS IN ...

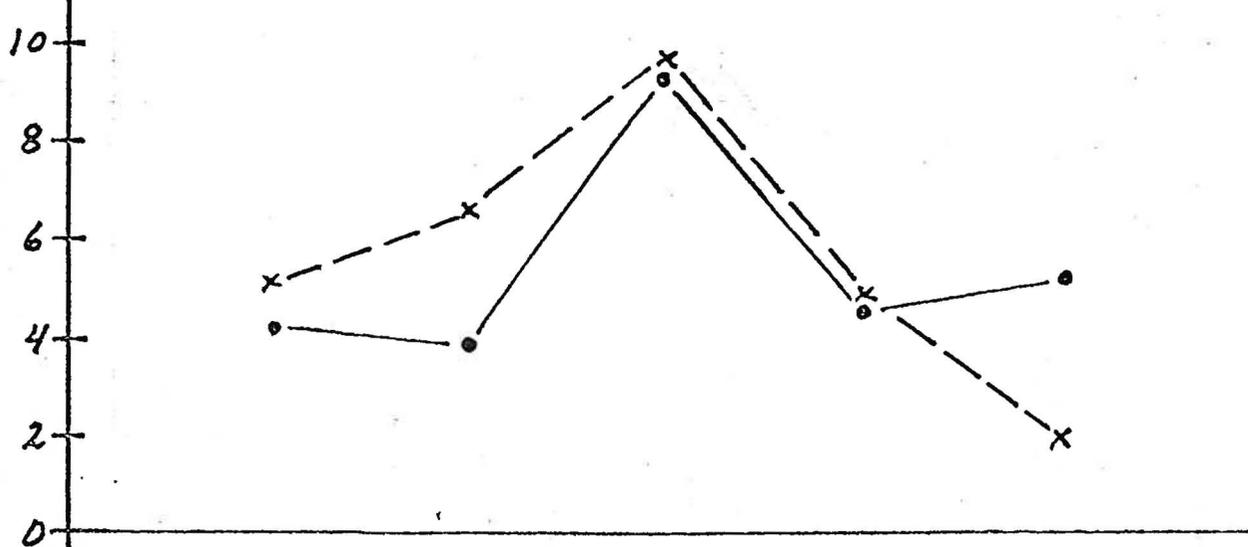
20  
15  
10  
5  
0



Dollar Loss per Acre for All Type of Rejects in All Varieties.



% Total Rejects in Nonpareil on 2 Meat Basis (by weight)



Production per Acre Pounds x 100

