

Pear Fruit Russett Studies

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Background

With prices for fresh packed Bartlett pears exceeding \$300 per ton in 1986 and processing pears valued at just under \$200 per ton, the obvious incentive is produce fancy looking pears for fresh packing. One defect that diverts Bartlett pears from the fresh market to the processing market is skin russett.

Pear fruit russett is caused by many things including moisture on the fruit when the fruit is small. Many pesticidal sprays applied to small fruit are suspected as causing russett which enlarges as the fruit grows. Recently certain hormone and fungicidal sprays are reported as reducing fruit russett. The purpose of these trials were to assess the timing and frequency of some hormone and fungicidal and their effect on pear fruit russett.

Results in previous years

In 1984 a few trees sprayed with a mixture of Gibberellins 4 and 7 at 5, 10 and 20 ppm reduced fruit russett considerably in Mendocino County. This agreed with data from England and eastern U.S. on Golden Delicious apples. The drawback to this treatment was that reduced bloom occurred the year after treatment with 20 ppm Gibberellic acid (GA) but not those trees treated at 5 to 10 ppm GA.

During 1985 many sprays of GA 4 and 7 were applied to pear trees in Yuba, Lake and Mendocino Counties. Results of this work were reported in annual research reports for California Tree Fruit Agreement. In summary the 1985 data showed a net increase of 10 to 15% more russett-free fruit resulted from GA sprays at 7½, 10 or 15 ppm applied weekly the first 4-5 weeks after petal

fall. Sprays applied later in the season failed to reduce pear fruit russett. At the higher concentrations fleshy, protruding calyxes were noted on the blossom end of pears in 10% to 25% of the pears. Return bloom was better than with 1985 treatments. Captan fungicide used to reduce lacey russett of prunes also reduced pear russett as much as or better than Gibberellic Acid (GA) treatments.

See Tables 1 for 1985 data or 1985 research report from CTFA for all of 1985 data.

Objectives in 1986 work

In an effort to avoid fleshy, protruding ends on Bartlett's Gibberellic acid #4 was compared to a mixture of Gibberellic acids #4 and #7. Based on research in the UK (England) GA 4 alone gave russett control without the bad side effects like reduced bloom and flesh ends on pears caused by the mixture of GA 4 and 7. Therefore GA 4 was compared with GA 4 and 7 at 2 or 3 rates in Lake, Mendocino, Yolo and Yuba Counties applied at similar times as used in 1985. Also Captan sprays were compared to GA sprays as to their effect on fruit russett, pear shape and return bloom.

Procedures in 1986

Orchards with some to severe russett problems were chosen in Mendocino, Lake, Yuba and Yolo Counties were chosen for hand spraying 1 to 1½ gallons per tree of Gibberellic acid or Captan from petal fall to 4 weeks later on a weekly basis. At harvest time fruit samples were taken from each tree and treatment and graded for russett. At least two rates were used in three orchards and 10 ppm was used in all orchards.

Results in 1986

Briefly stated results on russett reduction were 10 to 20% in most orchards being similar to previous years.

In Yuba County (see table 2) both GA 4 or GA 4 and 7 increased russett free fruit from 66% to about 80% at rates of 10 or 15 ppm. GA 4 had slightly less "bad" or protruding ends than GA 4 and 7 sprays.

In Lake County four Gibberellic acid sprays at 10 to 20 ppm increased russett free fruit from 62% to about 80% (See table 3). GA 4 gave about half as many "bad" protruding flesh calyx ends as did the mix of GA 4 and 7 thus demonstrating again that GA 4 is the safer, yet equally effective russett reducing Gibberellic acid.

Sprays of Gibberellic acid in Mendocino County applied weekly at 10 ppm increased the amount of russett-free fruit in 3 out of 4 orchards 10 to 20% (see tables 4). GA 4 sprays produced few more "bad" ends than the unsprayed controls and much fewer "bad" ends than GA 4 and 7. The so called "bad" ends are slightly fleshy and protruding like commonly seen on Washington state fruit but still acceptable in US#1 grade packed Bartletts. This tendency for enlarged ends on Washington state Bartletts is probably due to natural occurring Gibberellins in their fruit.

Scab control sprays have been suspected of increasing fruit russett just as copper based blight sprays are known to increase russett. In Mendocino County five orchards with or without Captan were sprays sampled and fruit rated for russett. In all orchards Captan lowered the amount of russett dramatically (see tables 5 and 6). When Captan was used instead of cyrex for scab control during the month following bloom russett-free fruit was about 50% while cyrex sprayed trees yielded only 20 to 30% russett-free fruit. Scab control was superior in the cyrex treated portions of the orchard compared to the Captan treated areas. In other comparisons when Captan was added to the Terramycin blight control sprays every week the fruit russett in cyrex-scab-treated was as good as Captan only treated orchards (for scab and russett).

Even when Captan was applied to some trees receiving Dr. Lindow's blight and frost antagonistic bacteria the amount of russett-free fruit was increased by weekly Captan sprays (see table 5 orchard N).

At Davis dilute sprays (400 gal/acre) and concentrate sprays (100 gal/acre) with GA 4 vs GA 4 and 7 were tried. Dilute sprayed trees showed slightly more russett than concentrate sprays. Neither GA 4 nor GA 4 and 7 sprays caused protruding ends in this test.

Summary and conclusions

Fruit russett on Bartlett pear fruit can be reduced in many orchards with Gibberellin sprays applied weekly for the month following bloom. In another project Dr. Lindow has shown that orchards with below average russett may naturally have more Gibberellin producing bacteria than bad russett orchards which tend to have more auxin or indole acetic acid producing bacteria which increase fruit russett. Thus Gibberellins improve fruit finish or reduce russetting. However, Gibberellin-sprays are not registered for pears. The manufacturer does not want to go through the costs of registering Gibberellins on pears for russett control because not all orchards respond to Gibberellin sprays. In these situations dissappointed growers may demand payment for lack of expected performance.

Since Captan has always given such good russett control, it seems logical to test other similar type fungicides to see if similar benefits are obtainable. These fungicides are already registered for pears so might be used for fungus and russett control. Further Captan treated fruit are not wanted in Canada and may have limited future in United States it seems desirable to test other fungicides in 1987 for russett reduction.

Costs of Gibberellins or fungicides range from \$15 to \$25 per acre for a total of four treatments and benefits exceed this cost especially if these

materials are added to fireblight sprays. Benefits from russett reducing sprays could be about 2 tons of packable fruit per acre. If 10% improvement occurs from a 20 ton orchard or 15% from a 15 ton orchard the net gain is about 2 tons per acre. If packed fruit are worth \$40 to \$100 per ton more than processing fruit considerable effort and expense can be devoted to russett reducing sprays.

Table 1 GA 4 + 7 Tests in Ukiah in 1985

| | <u>Russetted Fruit*</u> | | | <u>Number of Fruit with good and bad blossom ends</u> | | |
|----------------------|-------------------------|-----------|------------|-----------------------------------------------------------|---------------|--------------|
| | <u>No</u> | <u>S1</u> | <u>Mod</u> | <u>Good</u> | <u>Fleshy</u> | <u>Prot.</u> |
| Control | 71 | 51 | 29 | 117 | 21 | 11 |
| 5 ppm wks 2-5 | 90 | 43 | 16 | 33 | 61 | 57 |
| 10 ppm wks 2-5 | 83 | 56 | 11 | 21 | 52 | 77 |
| 10 ppm wks 1-4 | 79 | 66 | 5 | 83 | 43 | 24 |
| 10 ppm wks 2-5 | 83 | 56 | 11 | 77 | 52 | 21 |
| 10 ppm wks 3-6 | 77 | 65 | 9 | 46 | 54 | 25 |
| 10 ppm wks 4-7 | 60 | 65 | 24 | 49 | 59 | 17 |
| 10 ppm wks 2+4 | 83 | 56 | 11 | 47 | 49 | 29 |
| 20 ppm wks 2+4 | 88 | 53 | 9 | 24 | 48 | 53 |
| 20 ppm wks 1-4 | 88 | 53 | 9 | 15 | 44 | 91 |
| 10 ppm wks 2-5 | 83 | 56 | 11 | 21 | 52 | 77 |
| 2 lbs Captan wks 1-4 | 86 | 57 | 7 | 110 | 27 | 13 |

*Sample about 150 fruit from each treatment

Table 2 Yuba County Pear Russett Spray⁰ Tests 1986

| TREATMENTS | | | | PERCENT PEARS WITH RUSSETT | | | |
|----------------------|----------|----|--|----------------------------|-----------------------|---------------------|-----------------------|
| | | | | None ¹ | Moderate ² | Severe ³ | Bad Ends ⁴ |
| Control ⁵ | | | | 66% | 21% | 13% | 2% |
| GA ⁶ 4+7 | 10ppm | 4X | | 78 | 18 | 4 | 8 |
| GA 4+7 | 15ppm | 4X | | 82 | 14 | 4 | 12 |
| GA 4 | 10ppm | 4X | | 78 | 16 | 6 | 6 |
| GA 4 | 15ppm | 4X | | 80 | 15 | 5 | 10 |
| Captan | 4 lbs/ac | | | 81 | 15 | 4 | 2 |
| Captan | 2 lbs/ac | | | 77 | 14 | 9 | 1 |

⁰Spray applied by hand to 25 year old trees 1 to 2 gal/tree

¹None - no visible russett that would exculed fruit from grading better than US#1

²Moderate - borderline russett for packing US#1

³Severe - too much (over 25%) surface russetted not fit for packing US#1 grade

⁴Bad - Flesh calyx on blossom end protruding excesively
- maybe legal US#1 grade but looks bad and would not be packed as first label

⁵Control - trees not receiving any russett sprays but received normal insecticide and fungicide sprays

⁶GA - Gibberellic acid sprays (GA types 4 and 7 or GA 4 as type 4 Gibberellic acid)

Table 3 Lake County Russett Spray Tests for 1986

| TREATMENTS | | | | PERCENT FRUIT WITH RUSSETT | | | |
|------------|---------------|----|--|----------------------------|-----------------|---------------|-----------------|
| | | | | <u>None</u> ¹ | <u>Moderate</u> | <u>Severe</u> | <u>Bad Ends</u> |
| Control | | | | 62% | 30% | 8% | 1.5% |
| GA 4+7 | 10ppm | 4X | | 81 | 15 | 4 | 18.5 |
| GA 4 | 10ppm | 4X | | 80 | 16 | 4 | 7.0 |
| GA 4+7 | 20ppm | 4X | | 84 | 15 | 1 | 22.0 |
| GA 4 | 20ppm | 4X | | 80 | 18 | 2 | 12.0 |
| GA 4+7 | 20ppm | 2X | | 73 | 22 | 5 | 18.0 |
| Captan | 2 lbs/100 gal | 4X | | 79 | 18 | 3 | 2.5 |

¹See footnotes under table 1 for description of russett

Table 4 Mendocino County Russett Spray Tests for 1986

| TREATMENT | | | PERCENT PEARS WITH RUSSETT | | | |
|------------------|-------|----|----------------------------|-----------------|---------------|-----------------|
| | | | <u>None</u> ¹ | <u>Moderate</u> | <u>Severe</u> | <u>Bad Ends</u> |
| <u>ORCHARD A</u> | | | | | | |
| Control | | | 33% | 53% | 14% | 6% |
| GA 4+7 | 10ppm | 4X | 35 | 45 | 20 | 13 |
| GA 4 | 10ppm | 4X | 35 | 51 | 14 | 6 |
| <u>ORCHARD B</u> | | | | | | |
| Control | | | 26% | 46% | 28% | 4% |
| GA 4+7 | 10ppm | 4X | 46 | 32 | 22 | 12 |
| GA 4 | 10ppm | 4X | 38 | 37 | 25 | 8 |
| <u>ORCHARD C</u> | | | | | | |
| Control | | | 11% | 49% | 40% | 3% |
| GA 4+7 | 10ppm | 4X | 22 | 41 | 37 | 15 |
| GA 4 | 10ppm | 4X | 16 | 41 | 43 | 5 |
| <u>ORCHARD D</u> | | | | | | |
| Control | | | 24% | 35% | 41% | 4% |
| GA 4+7 | 10ppm | 4X | 42 | 32 | 26 | 18 |
| GA 4 | 10ppm | 4X | 43 | 25 | 32 | 12 |
| GA 4+7 | 20ppm | 4X | 45 | 30 | 25 | 20 |
| GA 4 | 20ppm | 4X | 61 | 23 | 16 | 18 |
| GA 4 | 20ppm | 2X | 61 | 20 | 19 | 14 |

¹See footnotes under Table 1 for description of russett

Table 5 Mendocino County Captan Tests for 1986

| TREATMENTS | | PERCENT PEARS WITH RUSSETT | | |
|----------------------|-----------|----------------------------|-----------------|---------------|
| | | <u>None</u> | <u>Moderate</u> | <u>Severe</u> |
| <u>ORCHARD H</u> | | | | |
| Captan | 2 lbs/100 | 57% | 24% | 19% |
| No Captan | | 13 | 35 | 52 |
| <u>ORCHARD L</u> | | | | |
| Captan | 2 lbs/100 | 51% | 25% | 24% |
| No Captan | | 31 | 42 | 27 |
| <u>ORCHARD N</u> | | | | |
| Antagonist | | | | |
| bacteria along | | 42% | 34% | 24% |
| Antagonistic | | | | |
| bacteria plus Captan | | 59% | 23% | 18% |

Table 6 Mendocino County Scab and Russett Tests in 1986

| TREATMENT | PERCENT PEARS WITH RUSSETT | | |
|----------------------------------------------------|----------------------------|-----------------|---------------|
| | <u>None</u> | <u>Moderate</u> | <u>Severe</u> |
| <u>ORCHARD M</u> | | | |
| Cyprex only | 20% | 22% | 58% |
| Captan only | 52% | 20% | 28% |
| Cypress alternated with Captan in blisht sprays | 63% | 17% | 20% |
| <u>ORCHARD Y.M.</u> | | | |
| Cyprex only | 31% | 20% | 49% |
| Cyprex + Captan | 58% | 18% | 24% |