

Implementation of non-antibiotic programs for fire blight control in organic apple and pear in the western United States



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Situation and Need

Fire blight – serious disease of apple and pear

- Caused by bacterium *Erwinia amylovora*, native to N. America.
- Infects flowers, shoots, limbs, trees, orchards.
- Spread by insects, rain, wind; key is to prevent infection.
- Commercial varieties lack adequate disease resistance.
- Antibiotics, copper have been main control tools.



Examples of fire blight disease: a) infected blossom and bacterial ooze; b) classic dead shoot; c) dead rootstock; d) severely infected 'Pink Lady' apples (bronzed leaves are dead).

Organic apples and pears

- >80% of U.S. production from western states.
- 12% per year growth in demand recently (Fig. 1).
- Antibiotics allowed before National Organic Standards, and on list of allowed synthetics; National Organic Standards Board voted to end use as of October 2014.
- Need for more knowledge, testing, integration of new products and tactics; effects of variety, climate, weather.
- Consistent fire blight control needed to keep U.S. growers in organic production; disease is not present in S. America and would be likely supplier instead.

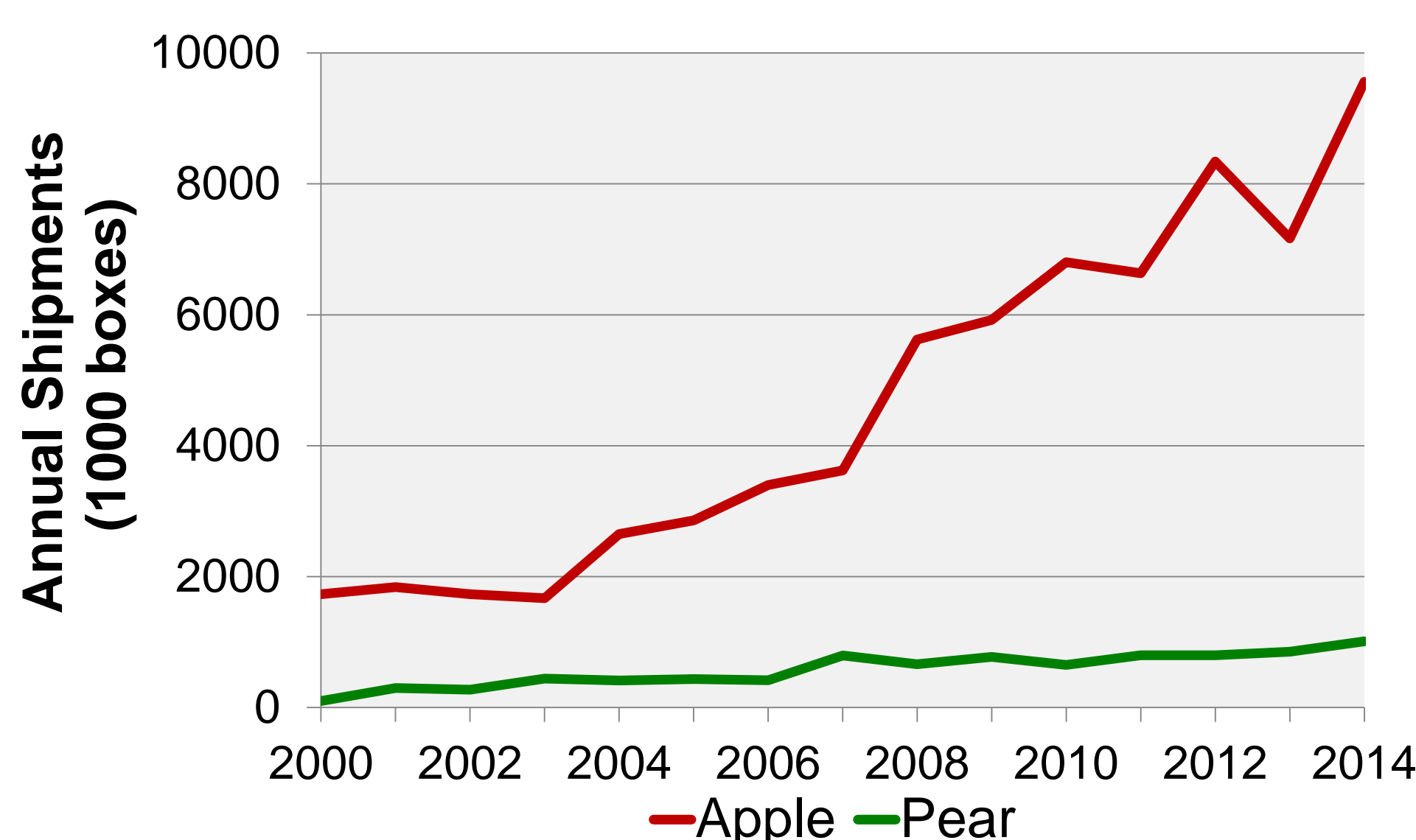


Figure 1. Growth of organic apple and pear shipments, Washington State.



Project Activities, Outputs

Validating current practices and testing new products

- Lime sulfur used for apple blossom thinning is a highly effective fire blight control, thus serving a dual purpose.
- Many new products have become available in recent years, requiring multi-year testing alone and in combination (Fig. 2).
- Different products work best at different points in the disease cycle, and certain sequences of products should be avoided.

Evaluating fruit russet (Fig. 3)

- Many products can have a phytotoxic effect on the fruit surface, thus making it unfit for fresh market sales. This effect varies with fruit variety, fruit development stage, weather, and other factors to understand before recommending a product.

Adapting disease models for organic fire blight control

- Existing disease models (e.g. COUGARBLIGHT) only predict infection risk during bloom and need to be adapted for use with biocontrols that require more lead time for efficacy.

Extending preliminary results annually as experience is accumulated

- Prior to the antibiotic phase-out, organic growers learned about non-antibiotic control through industry meetings, webinars, and on-line documents.

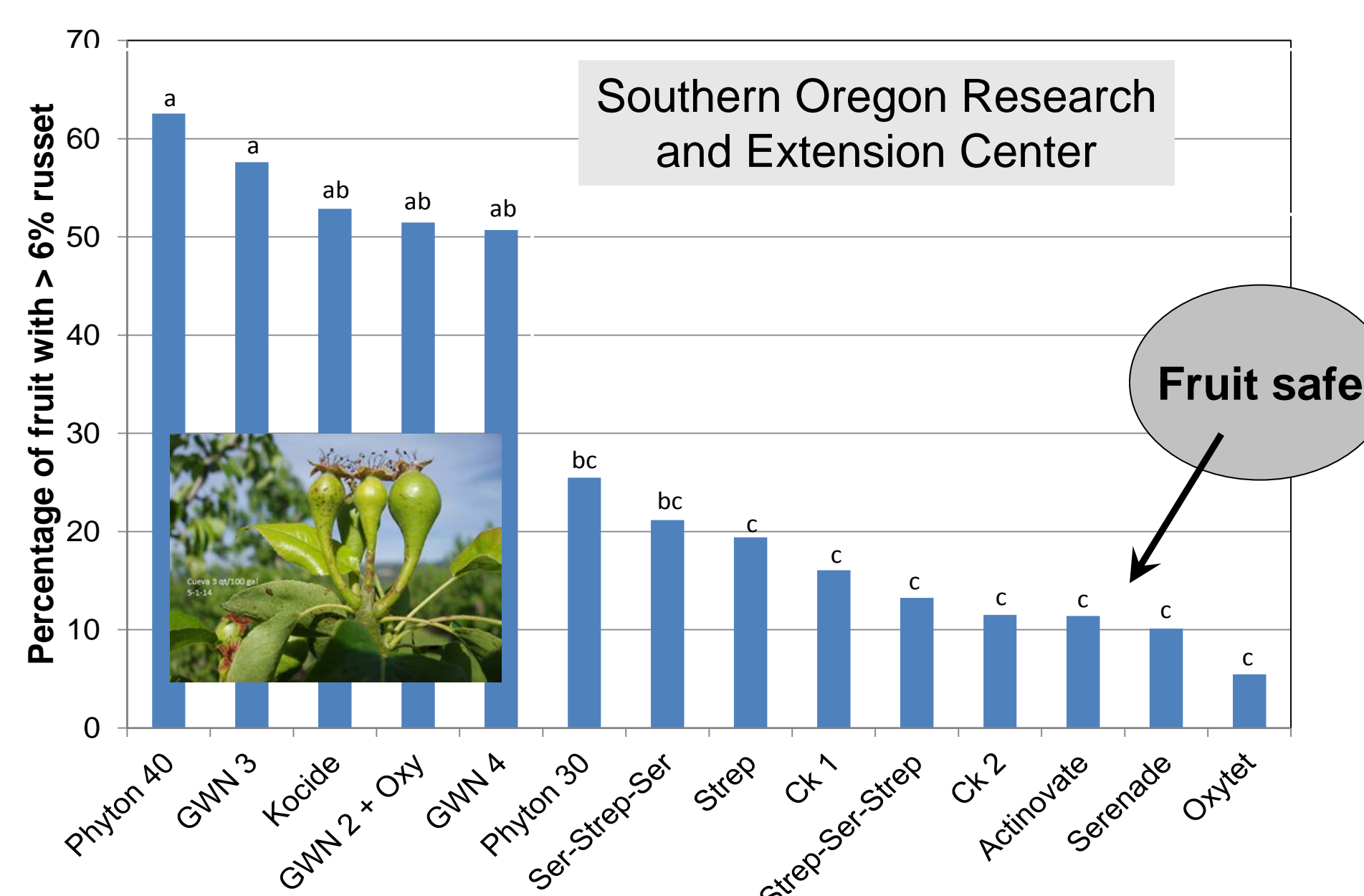


Figure 3. Fruit russet incidence on 'Comice' pear from non-antibiotic fire blight control products and combinations.

Educational Resources for Growers

- Presentations at dozens of grower meetings
- 3 eOrganic webinars
- Grower Guide https://www.organic-center.org/wp-content/uploads/2013/07/TOC_Report_Blight_2b.pdf
- Internet resources <http://www.tfrec.wsu.edu/pages/organic/fireblight>

Example non-antibiotic program with considerations for fruit safety:

- 1) Prebloom fixed: Fixed copper sanitation if fire blight was in orchard last year (5 to 6 lb/A)
- 2) Early bloom apple: Lime sulfur (plus fish oil) early bloom at 20 and 70% bloom. Reapply biological if LS goes on after biological.
- 3) Early bloom pear and apple Blossom Protect: One full, or two half apps, or two full apps if blight in orchard last year. In apple, BP immediately after 2nd LS. In smooth-skinned pears in wetter areas, russet risk might be unacceptably high. - Bloom-time Biological is an alternative, fruit-safe biological material.
- 4) Full bloom to petal fall, depending on cultivar russet risk/CougarBlight model risk: Serenade Optimum every 2 to 5 days (most fruit safe). Improved control: Mix Serenade Opt with Cueva (2 to 3 qts/A). Cueva every 3 to 6 days (3 to 4 qts/A) (least fruit safe).



Figure 2. Example of annual fire blight control product testing, Washington State. Blossom Protect performed as well as the antibiotic standard, oxytetracycline.

Impacts

Surveys have been conducted at grower meetings since 2011. Growers have become aware of non-antibiotic controls and tested them in advance of the organic rule change.

	Have you tried a non-antibiotic control regime?		If so, was it successful?	
	Jan 2012	Jan 2015	Jan 2012	Jan 2015
Yes	73%	67%	33%	78%
No	27%	33%	67%	22%

The larger base of commercial organic apple and pear growers in the Pacific Northwest has led to more impact from the research there than in California (Fig. 4).

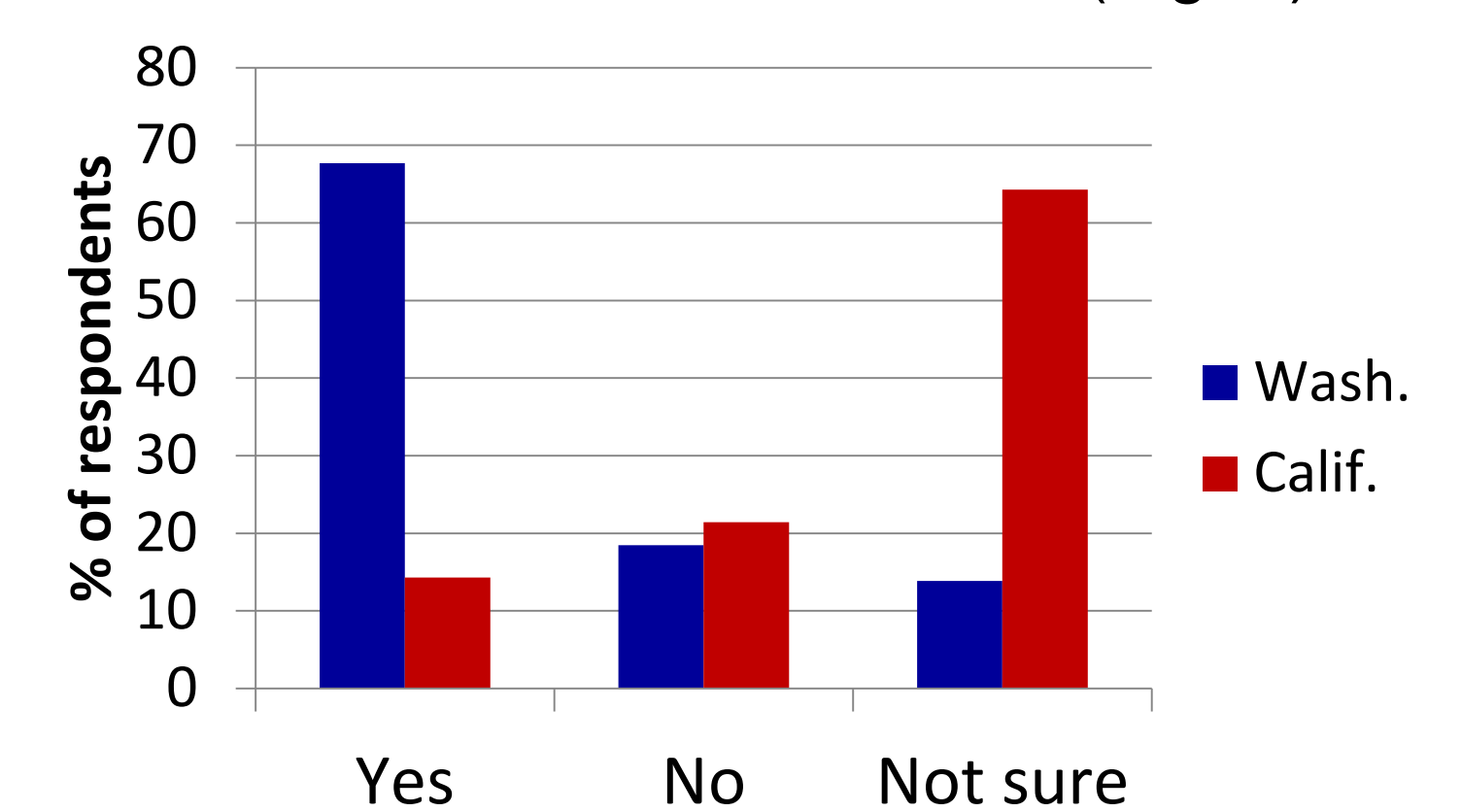


Figure 4. Has university research led to a change in your fire blight management?

When asked about the change to non-antibiotic fire blight control, **92%** of surveyed growers in January 2012 planned to reduce their organic acres; this response had dropped to **28%** by January 2015. If the rule change had led to a 25% reduction in organic 'Gala' apple shipments from WA ('Gala' is the leading organic variety), that would have cost the state economy ~\$4 million in 2012 and **>\$12 million** in 2014 in **lost value** of organic premiums.

As a result of the research and outreach, growers are feeling more optimistic about the future of organic apple and pear production (Fig. 5). They are taking a systems approach, using new products such as Cueva™ (15,000 acres in 2014 to 37,000 acres in 2015) as well as adjusting nitrogen rates, irrigation timing, insect vector control, canopy shape and other factors known to influence the disease. Domestic production of organic apples and pears is likely to increase.

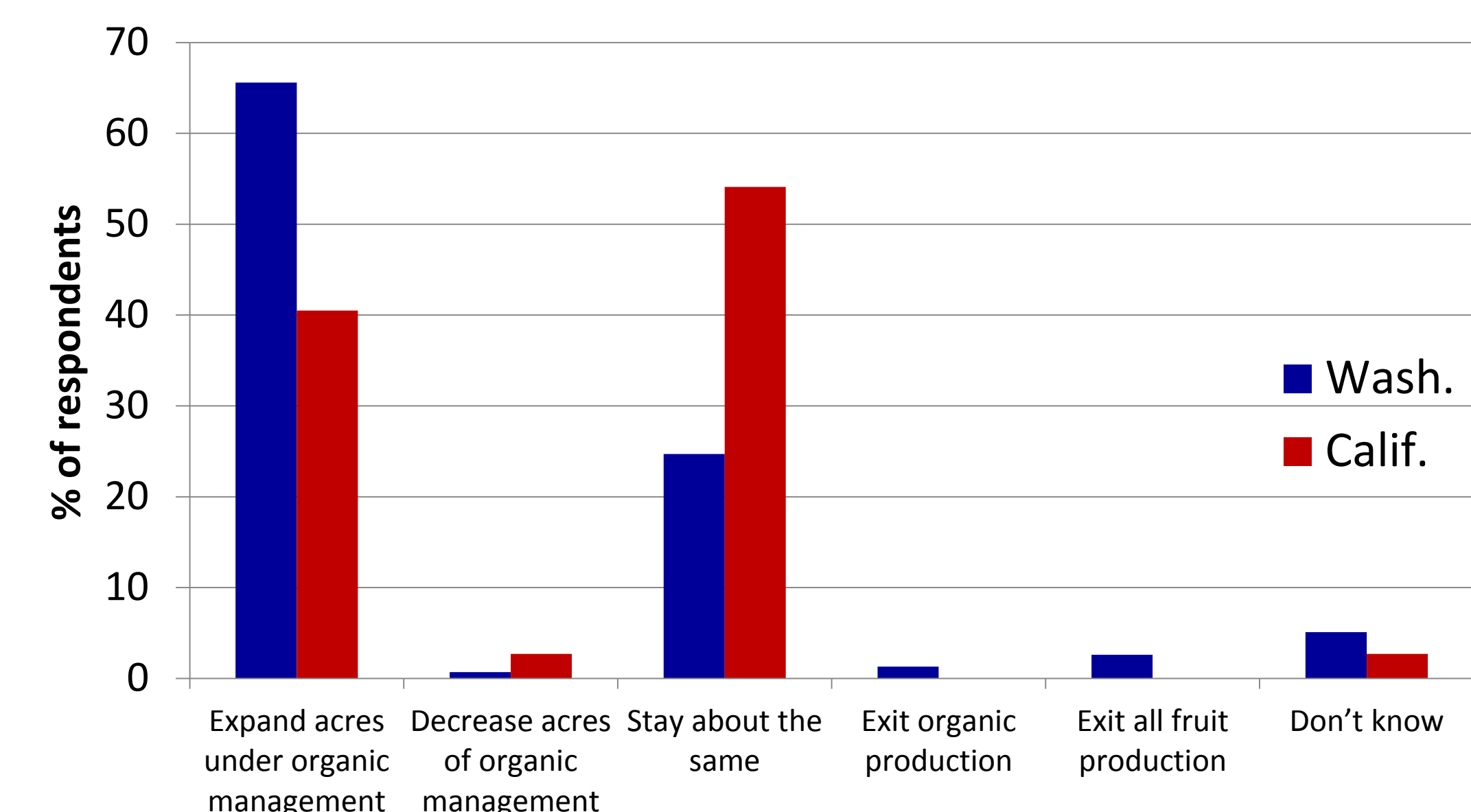


Figure 5. Grower plans for organic tree fruit production in next 5 years.

Summary

- Significant progress in testing non-antibiotic controls
- Refining their use in integrated fire blight management
- Preventing loss due to tree damage or fruit russet



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