# CAN QUACKGRASS BE CONTROLLED IN AN ORGANIC MULCH SYSTEM?

## Effect of four organic mulches for quackgrass control in orchard floor management; a grower's experience.

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In my orchard of 620 dwarf apple trees weed control has been managed with hay mulch for four years. Difficulty in controlling quackgrass (Agropyron reptens) along with the bulk and costs of the hay system prompted me to seek alternatives.

### History

Studies have shown that orchard crops, especially dwarf trees, are healthier, crop earlier, and are more productive if weed control is rigorously practiced. The root competition of grasses and weeds steal nutrients from the trees. Herbicides are generally used for understory management in commercial fruit production. Safety, weed resistance, damage to soil organisms, potential ground water contamination and increasing herbicide costs are spurring research into other forms of weed control such as in row rotary tilling (Schupp and McCue 1991).

For commercial organic fruit growers the search for a sustainable weed control has been difficult - the choices being limited to mulches, mowing or cultivation. Mulches can accomplish the same goal when the mechanical action of excluding light and the physical barrier causes the unwanted plants to die. Mulching has the added benefit of moisture retention, adding nutrients and organic matter, ease of picking up fruit drops and working around the base of trees.

Research has been done comparing mulching systems using hay, wood chips, tarpaper and synthetic materials (plastic and landscape fabrics) (Rist, 1989; Merwin, Rosenberger, and Engle 1992). Synthetics have been the least effective and most expensive. Wood chips provided control as well as hay but costs were high.

Along with our hay mulch in our orchard we experimented with shredded newspaper in an effort to reduce cost and eliminate the introduction of weed seeds from hay. The shredded paper was easily blown so the next step was to weight it with hay. At this point the quackgrass thought this was a wonderful home and luxuriated in growing through the soft layers. Additional layers of hay only provided more soft places to grow. The grass driving alley originally seeded to creeping red fescue also grew into the mulch area.

At this point I thought "I'd like a mulch that lays flat, that doesn't add a huge amount of biomass at once but eventually does decompose into the soil, is easy to handle, lasts more than one season, and actually works." I began a serious search.

A report of a woolen felt manufactured as a mulch mat propelled me to devise a comparison study; the other mulches being cardboard, newspaper with hay on top, and hay alone as the comparison standard. The materials would be applied over existing infestations of quackgrass in the orchard to evaluate the relative costs and effectiveness.

## Method

Four replications of the four treatments were applied in early May in a random number series, each plot being one hundred feet in length and five feet wide. Time for application was recorded. Initial test plots of 24"x24" were dug at each treatment plot and total mass of rinsed quackgrass roots were weighed. In late October this was repeated for comparison. Visual recording of grass infestation was made in the form of photographs and repeated at 28 day intervals over the season.

## Procedure

Hay treatment was applied at a rate of one half bale per tree. Newspaper obtained from the recycling center and a newspaper office was opened flat, with glossy removed. Sections were overlapped eight inches to the next, leaving three inches of exposed earth at the trunk of the tree. This amounted to at least eight layers accumulated sheets of newspaper. Enough hay was placed on top to keep paper from blowing, approximately one quarter bale per tree. Cardboard, available from local businesses and recycling was overlapped eight inches to the next. The row was two boxes wide,

approximately five feet wide, and at the center of the row the box was cut to accommodate the tree. The cardboard was held in place with earth staples. Wool mulch, a manufactured needle punch product, was tested in two sizes; three foot wide rolls along either side of the row, and the five foot wide roll slit with scissors to accommodate each tree. Some earth staples were used at center, and edges were set by a spade forcing the wool down into the sod. Common pins closed the gaps in some places when necessary.

Discussion

The newspaper/hay application needs to be put on when there is no wind, and edges of paper will blow if hay does not cover it. Dandelion and Queen Anne Lace will push the paper aside, but after it was reapplied the weeds subsided. Moisture soon molded the paper to the ground. This procedure must be done before grass growth starts or the area must be mowed initially.

The cardboard was an interesting study. I used 1) refrigerator boxes cut open used single thickness, 2) medium size boxes used double thickness and 3) what I call "Asian" cardboard; a recycled product itself. These "Asian" boxes were actually double walled so there were four thicknesses used. The short fibers in this cardboard made it too soft for the staples to hold, so I devised a string across the top tied to staples, (see fig 1). The solution worked well with synthetic string, not jute. The Asian cardboard absorbed moisture readily and conformed to the earth. The refrigerator boxes cupped with moisture and drying, and finally settled down. The flattened medium size boxes worked well but did not conform to the earth. Cardboard around the trunk made it difficult to weed and care for the tree trunks. It was a little damp at trunk base because of reduced air flow.

The wool mulch had a profound effect on the weeds below; on sunny days the temperature reached 95° below the wool. The dandelion parched, as did the tufts of orchard grass. During installation the earth staples were difficult to work through the wool. The three foot wide rolls were more satisfactory in ease of application than the five foot wide rolls, and the actual time of application was equal for both. The wool has the potential for lasting for two to three seasons, and where the wool was weedless it was in good condition at the end of the season. The wool at the edge adjoining the grass alley was decomposed.

Mowing of the alley ways was done with an offset bushhog, which would sometimes hit the mulches if the ground was uneven. This did not disturb the hay much, but the newspaper/hay combination and the cardboard were pushed out of

place at first. When they settled down there was less of a problem. The wool sometimes snagged with this type of mower, but this was not a problem with a smaller rotary mower, which was also able to clear the other mulches. The bushhog was modified by mounting an old ski on the edge of the mower to glide over the mulches.

At the end of the season the cardboard was removed. After a bumper crop of acorns last year and the lack of acorns this year the meadow vole population seems to have moved into the orchard and chosen the cardboard as a home.

## Results

Each of the materials used in this study succeeded in keeping the understory relatively weed-free. The quackgrass made a quick reappearance in the hay mulch, as expected. The wool mulch postponed the reemergence but quackgrass was visible in four weeks from initial application, and continued to push through all summer. The quackgrass under the newspaper/hay was killed by lack of light and the physical barrier. In the middle of September the paper had lost its integrity and new rhizomes were able to grow through. The cardboard was effective in killing the quackgrass roots as evidence of dead roots found in the final test pit. The cardboard also prevented the new invasive roots from emerging, as they could not push through the cardboard thickness of all three types of cardboard.

## Conclusion

My findings suggest that quackgrass may be controlled by the application of a cardboard or a newspaper/hay mulch system in a perennial fruit production. Cardboard may last more than one season, though the newspaper/hay would require yearly application. Both require adequate mouse protection for the trees. Costs of each system are comparable, with the exception of the wool mulch. The abilities of the wool mulch to inhibit the growth of annual weeds suggests that it may be useful in a new planting with no perennial weed pressure, and then replaced by another system in a few years. My future management of quackgrass will use cardboard on heavy infestations, and the newspaper/hay treatment on the remainder of the rows.

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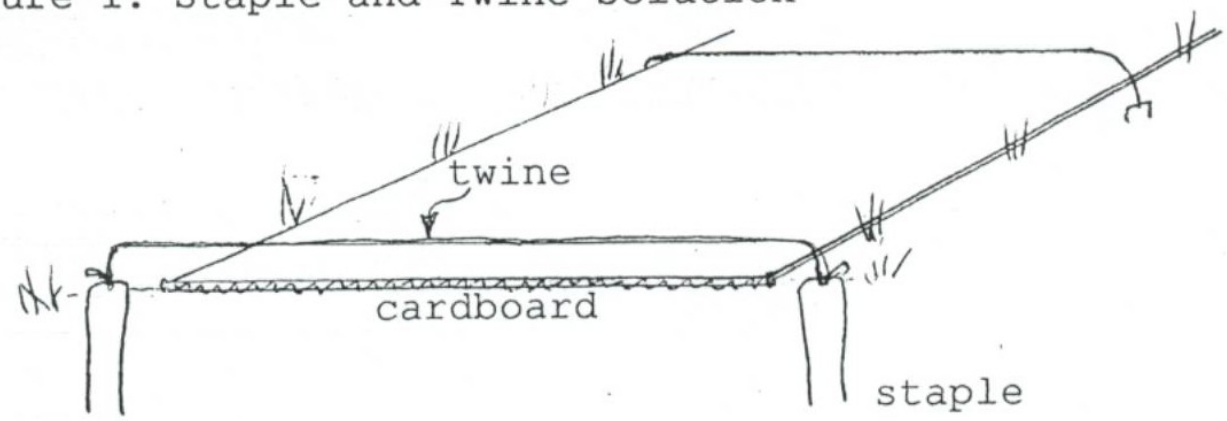
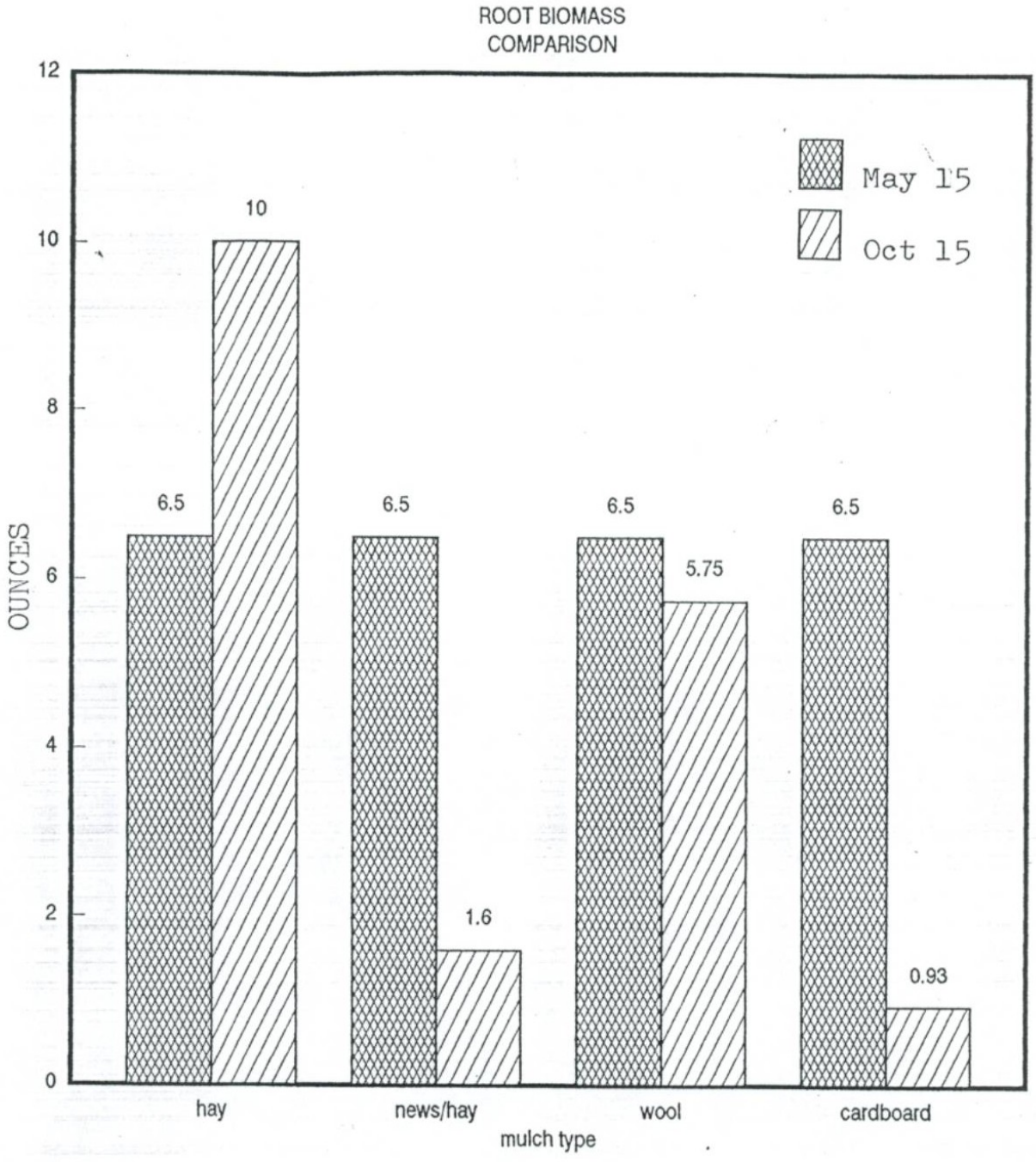
## COST COMPARISONS FOR DIFFERENT MULCH TREATMENTS

| Treatment | Labor (installation) | Labor (procurement) | Materials | Total Cost per 100 foot plot | Cost per acre (materials on hand) |
|---|---|---|---|---|---|
| Hay | 0.75 hrs. $4.90 | 0.75 hrs. $4.90 | 10 bales $15.00 | $24.80 | $640.00 |
| Newspaper/ Hay | 2 hrs. $13.00 | 1 hr. $6.50 | newspaper $0.00<br>4 bales $6.00<br>gas $2.00 | $27.50 | $684.00 |
| Cardboard | 2 hrs. $13.00 | 1 hr. $6.50 | cardboard $0.00<br>twine $2.00<br>staples $7.00<br>gas $2.00 | $30.50 | $792.00 |
| Wool | 2 hrs. $13.00 | $0.00 | wool mat $110.00<br>shipping 16.00<br>staples 15.00 | $141.00 | $5076.00 |

Costs based on following assumptions: labor = $6.50/hr.; gas = $1.20/gal.; hay = $1.50/bale; acre = 605 trees (3600 linear row feet).

Figure 1. Staple and Twine Solution






Roots present in $2ft^2$ (quackgrass)