ESPS Satellite Project

USE OF WALNUT HULLS FOR WEED CONTROL

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Abstract:

Walnut hulls were applied 3 inches deep in the tree row of a mature conventional prune orchard to determine the suitability of walnut hulls as a mulch for weed-control. Evidence of phytotoxicity from the presence of juglone was not seen in the weeds growing through the mulch nor on the trees. The hulls were slightly less effective in controlling weeds than the almond shells, which have no known allelopathic properties. Almost all weed pressure in the mulch plots was due to Yellow nutsedge (*Cyperus esculentus)* which developed late in the season.

Introduction:

Walnut hulls used as mulch around perennial crops may be an effective means of controlling weeds, not only from the weed-smothering effect of the mulch, but also from the allelopathic properties of the hulls. Walnut hulls are known to contain a substance called juglone, which acts as a respiratory inhibitor in many plants (*Purdue pub. #HO-193, Black Walnut Toxicity*). Walnut hulls also contain about 5% protein at harvest, which may contain sufficient amounts of nitrogen that would also cause them to be of value as a nitrogen source.

Walnut hulls are typically not utilized for any purpose and are often a disposal problem for hullers, and many walnut processors have concerns that the disposal of walnut husks may be regulated in the near future. Often, husks and culls are dumped into piles outside, where they may contribute to nitrate contamination after decomposition.

The purpose of this trial was to a) study the effectiveness of walnut hulls as a weed control tool, b) evaluate any phytotoxicity to the trees treated with the walnut hulls, c) determine if the weed control properties are due to the effects of juglone or from the mulching effect, d) evaluate the walnut hulls' potential as a source of plant nutrients, e) determine the effective life-span of hulls as an effective weed control agent.

Procedures:

Walnut hulls were applied as a mulch around five trees in a 25-year-old conventional prune orchard near Hamilton City in Glenn County. The mulch was applied in an area 20′ long by 5′ wide by 3″ deep, resulting in 25 cubic feet per tree. The area covered corresponded to the strip spray area within the tree row. The hulls were obtained from a local huller and had been allowed to sit in large piles for 2-3 months. Besides walnut hulls, the material also contained twigs, leaves, culled walnuts, and walnut shells, and was moist and partially decomposed. Almond shells (which did not contain hulls) were also collected and applied in the same manner. The shells were applied in order to determine if the juglone or the mulching effect was responsible for any weed control.

Both the walnut hulls and almond shells were collected and applied 1/14/00. The treatments had been sprayed with Roundup ® earlier that fall, and had not been cultivated. No preemergent herbicides had been applied for at least three years. Besides the hull and shell treatments, an unsprayed control and a herbicide treatment was added, identical to the grower's herbicide program (1 quart per acre Roundup Ultra ® sprayed several times per year). The herbicide plots were sprayed three times during the span of the trial: on March 25, on May 25, and on July 6. One pint per acre of 2,4-D was also included in the March spray. Gramoxine was also applied around the base of the trees to control suckering. The entire trial was sprayed with Roundup on September 11 to control nutsedge. The orchard was a French Prune orchard with solid-set sprinkler irrigation, with a spacing of 20′ x 20′. The treatments were placed in a single tree randomized complete block design and replicated five times. Weeds growing under these trees were identified and visually rated for percent ground cover once a month.

Samples taken from the walnut hulls on 1/14/00 were sent to the U.C. Davis D.A.N.R. Analytical Laboratory and analyzed for nitrogen, phosphorus, potassium, copper, zinc, and pH.

Results and Conclusion:

See Figure 1 for the percent ground cover by weeds. Weeds able to grow through the mulch were chickweed, annual bluegrass, cheeseweed, filaree, and rough buttercup early in the season and yellow nutsedge in the summer. There was no significant differences between the mulches and the herbicide treatment during the months of April, May, and June. The herbicide treatment was significantly different from the hull mulch (but not the shell mulch) during July. All treatments were significantly different from each other during August. The mulch treatments were initially better than the herbicide treatment since the plots were not sprayed until March.

Visual inspections found no signs of phytotoxicity to the trees in the experiment.

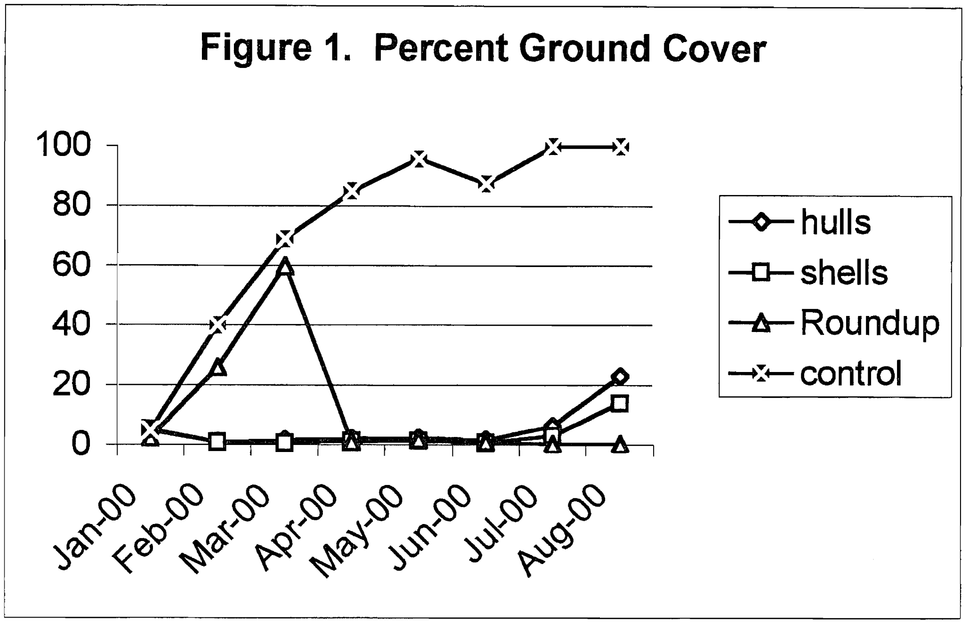

Table 1 shows the nutrient content of the walnut hulls used in this experiment. Since the hulls had been allowed to decompose for a month or two, these values will probably be different from those of fresh hulls. Table 2 gives nutrient values for the almond shells used in the experiment.

Table 1. Nutrient analysis of walnut hulls collected 1/14/00.

N-Total %	P-Total %	K-Total %	Zn Ppm	Cu Ppm	'pH
1.806	0.15	4.36	26	50.7	9

Table 2. Nutrient analysis of almond shells collected 6/9/00.

N-Total %	P-Total %	K-Total %	Zn Ppm	Cu Ppm	'pH
0.752	0.07	2.31	22	6.8	4.8

One cubic foot of wet hulls weighs about 28 lbs., and has a wet to dry ratio of 3.45:1 (determined by samples taken at application). This equals 200 lbs. of dry matter per tree. This amounts to total values of 3.7 lbs. N, 0.3 lbs. P, and 9 lbs. K per tree at the rate used in the experiment. The nitrogen and the other nutrients may not be available immediately and would probably take over one year to completely decompose and release the nutrients. Weights and dry down ratios were not taken from the almond shells used in this trial so nutrient amounts per tree could not be determined for that treatment.

No phytotoxicity to any of the trees or weeds was seen. As the hulls provided less weed control and only controlled weeds that were also controlled by the shell mulch, there probably was little or no weed control resulting from the juglone. This may due to the fact that the hulls were collected after harvest and had been allowed to decompose for at least a month. Also, the hulls were wetter than the shells, causing some dry-down, and the hulls probably decomposed quicker and released more plant nutrients than the shells, resulting in more weed growth in the walnut hulls. Perennial plants and established annuals at time of mulch application were able to grow through both mulches. Almost all the weed pressure in the mulches was the result of the emergence of Yellow nutsedge (a perennial weed) starting in April.

Since the hulls did not appear to cause any phytotoxicity to the trees, walnut hulls may be safe to apply in orchards. The nutrient content of the hulls is similar to manure or compost, and could supply a very significant amount of plant nutrients even if applied at lower rates than used in this trial. The hulls and shells also provided weed control comparable to a herbicide spray up to 5 months, saving the grower two Roundup ® sprays (total of 4 pints) and 1 pint 2,4-D. According to the 1998 UCCE Prune Cost Study, two Roundup® sprays would cost $37/acre to spray ($31 in material and $6 in application costs). Savings would be greater if the husks are actually able to contribute enough nitrogen and potassium to cut fertilizer applications (up to $76/acre, according to 1998 UCCE Cost Study). Costs would be unrealistically high if the mulch is applied by hand, but mechanical applicators could bring costs down to acceptable levels.

References:

Dana, Michael and B. Lerner (1994). Black Walnut Toxicity, Perdue Pub. # HO-193

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