# Feeding Value of Oat Hay

## stage of plant maturity at harvest affected total digestible nutrients in Kanota oat hay in evaluation trials with sheep

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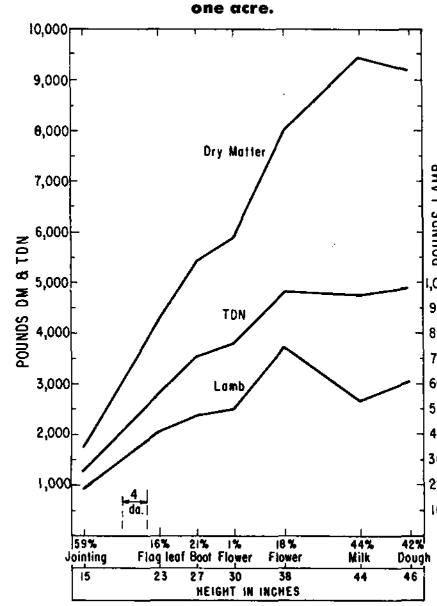
**Oats harvested** at the 18% flower stage produced the greatest nutrient yield in studies—feeding trials, digestion trials and chemical analyses of the forage—to evaluate the feeding value of oat hay.

Sheep were selected as the experimental animals and six wethers—randomly allotted—were individually fed hay from a 12-acre field of Kanota variety of oats. The field was uniform in soil type and had been fertilized. The stand was excellent, did not suffer from lack of water, and contained less than 1% foreign plants.

The oats were harvested at seven stages of maturity—from the 59% jointing through the 42% dough stage—in replicated strips throughout the field so that each stage represented all parts of the field. The stages were described by hand counting the number of stems in a particular stage. For example, 16% flag leaf stage meant that 16% of the stems had flag leaves; the remainder of the stems would be at a more immature stage. This method quite accurately describes the physiological age of the plants when harvested.

The entire field was sampled daily by randomly selecting plants cut at mower height. The daily forage sample was dried at 158°F, ground, and taken to the laboratory for chemical analysis. A

**Yields of dry matter, TDN and lamb from one acre.**




**Harvested at the 18%–20% flower stage Kanota oat hay had a greater feeding value than when harvested at other stages of maturity.**

yield of 9,600 pounds of dry matter—an excellent yield for this area—indicates that plant growth conditions for the oats were optimum.

To avoid the possibility that rain might introduce an unnecessary variable, the forage was harvested with a field chopper and dehydrated in a commercial alfalfa dehydrator. The dried forage was ground and pelleted to prevent selective refusals by the animals.

The daily gains of the sheep were relatively constant until the oats reached the milk stage, when there was a drastic drop in gains. Feed consumption was lower for the higher quality immature stages and higher for the milk and dough stage. The daily gains for the sheep fed the 59% jointing stage oats were significantly larger than the gains of the other sheep. The gains of the sheep fed the milk and dough stages were significantly lower.

The greatest decrease in the number of leaves on the oat plants is from the 18% flower stage to the 44% milk stage but more leaves dry and are lost when the forage advances from the milk to the dough stage.

Analyses of some important constituents in the growing oat plant showed protein to be very high in the jointing stage but decreased rapidly until the flower stage where the protein content tended to remain constant.

Holocellulose—alpha cellulose and hemicellulose—increased to the milk stage and then plateaued. The increase was not even or regular.

Lignin content was very regular in its increase until the milk stage and then it decreased.

The apparently digestible protein as determined in the digestion trial followed the same trend during advancing maturity as did the crude protein. However, the crude protein was more digestible at the younger stages.

The TDN—total digestible nutrient—content was 68% in the jointing stage but decreased to 50% in the milk stage. The formation of grain caused an increase in TDN until it was statistically greater than in the milk stage hay.

Plant production of TDN was no greater after 18% of the stems were flowering although dry matter production had increased. This was compensated for by the higher percentage TDN at the flower stage.

Production of lamb—indicative of the net utilization of nutrients after digestion—also increased until the oats reached the 18% flowering stage and then lamb production decreased but the oat forage dry matter continued to rise. An upturn in lamb production was noted when the forage entered the dough stage, emphasizing the importance of allowing oat hay to mature past the milk stage.

The results of these studies indicate

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**Composition of Forage in Plant Maturity Feeding Trials**
**Dry matter basis**

| Comparisons | 59% Jointing | 16% Flag leaf | 21% Boot | 1% Flower | 18% Flower | 44% Milk | 42% Dough |
|---|---|---|---|---|---|---|---|
| Lignin, % | 3.8 | 4.3 | 4.9 | 5.8 | 6.4 | 9.0 | 8.4 |
| Holocellulose, % | 35.0 | 37.0 | 35.0 | 43.0 | 40.0 | 52.0 | 50.0 |
| Crude fiber, % | 16.0 | 19.0 | 21.0 | 24.0 | 27.0 | 29.0 | 27.0 |
| Crude protein, % | 24.0 | 19.0 | 18.0 | 16.0 | 14.0 | 12.0 | 12.0 |
| Digestible protein, % | 17.4 | 13.1 | 11.0 | 10.5 | 8.5 | 6.4 | 7.0 |
| Total digestible nutrients, % | 68.0 | 65.0 | 65.0 | 64.0 | 60.0 | 50.0 | 53.0 |

## ROOT-LESION NEMATODE

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same treatments were made in two orchards, it was possible to analyze the interactions of rootstock and treatment, rootstock and orchard, and treatment and orchard. The interaction of rootstock and treatment was not statistically significant, reflecting the fact that growth of both California blacks and Paradox hybrids was improved in like manner by preplanting fumigation. However, the interactions analyses of rootstock and orchard, and treatment and orchard were statistically significant at the 5% level, indicating that growing conditions at the two orchards influenced the response to the treatments, and the relative performance of the rootstocks.

In March, 1956, the California blacks were pulled to allow normal growth of the Paradox hybrids remaining at each site. Roots of most of the California blacks—including those with good top growth at treated sites—showed considerable lesion formation. Moreover, soil samples taken in September, 1955, had shown that root-lesion nematode population density at treated sites had risen in many instances until it did not differ significantly from the population density at untreated control sites.

The response of the Paradox hybrids to preplanting fumigation indicated that they, too, were susceptible to the disease. It seemed doubtful that the remaining Paradox hybrids would continue to grow satisfactorily at the treated sites. Therefore annual Nemagon retreatments around half of the trees on treated sites were begun in March, 1956. The fumigant was injected by handgun at the rate of five gallons per acre over a 10′ × 10′ area covering the root zone of the tree. This provided Paradox hybrids with essentially three different histories in each of the two orchards: *1*—those grown at pretreated sites with annual retreatments begun after two growing seasons, *2*—those grown at pretreated sites without further treatment, and *3*—those grown without any fumigation treatment. Top growth of all trees except the complete checks continued to be satisfactory at the end of the fourth growing season. During the fourth season, growth of trees receiving annual Nemagon retreatments was significantly greater than growth of trees receiving preplanting treatment only.

In the Ventura County orchard the soil was a clay loam with a moisture equivalent of 26.7%. Test sites were fumigated in December, 1954, and California black walnuts planted in March, 1955. Treatments were arranged in five blocks of single tree replicates. Growth in all treatments was better than growth in the untreated controls. DD at 75 gallons per acre produced the greatest growth response.

The value of preplanting fumigation for walnuts depends on the duration of benefits. Striking initial growth responses are of no use, unless they presage productive walnut trees. Benefits of preplanting soil fumigation probably will be most prolonged where land to be replanted is left free of trees or vines for several years before fumigation, allowing time for woody, nematode-infected roots to rot. Such roots protect nematodes from soil fumigants.

The better growth of the San Joaquin County trees receiving supplemental Nemagon side dressings suggests the possibility that benefits of preplanting soil fumigation may be prolonged in that manner.

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## SUGAR-BEET NEMATODE

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tons per acre. This is further evidence of the importance of early planting to achieve maximum yields on sugar-beet nematode infested fields. The high population of nematodes surviving the treatments apparently explains the failure to obtain an increase in yield from any of the fumigants.

The significant decrease in yield at the 10 gallons per acre dosage of Nemagon was very likely a result of the stability of the chemical which—under some conditions—may persist in the soil for as long as six months.

In Plot No. *3* another attempt was made to increase control of the nematode in the upper 2″ or 3″ of the soil by the use of split applications of the fumigants. This required turning the soil by plowing between treatments. Forty-eight hours were allowed to elapse after the first fumigation was applied before the plots were plowed and the second dosage injected.

The nematocides DD and Nemagon were tested—alone and in combination—applied March 21 and 23. Soil moisture content was approximately 15% with a temperature of 50°–53°F. Beets were planted April 16, soil samples taken May 24 and yields recorded November 1.

The results showed no significant effect on the nematode population by the fumigants. There is a significant increase in yield in all of the treatments, but the maximum of 8.4 tons per acre is far below the minimum necessary for profitable production of beets.

In 1957, additional work was done in Plot *4* to test the effectiveness of row placement of DD. An area treated at the rate of 25 gallons per acre was compared with the same rate per acre injected by one chisel centered in the bed and two chisels per bed spaced 12″ apart.

The rate delivered by the single chisel was 83 gallons per acre and 41.5 gallons per acre for each in the two chisel application. The treatments were applied February 14, and beets planted April 10. Soil samples were taken April 26, and the beets were harvested October 2.

The results showed a highly satisfactory reduction in the nematode population, but the yields obtained were not sufficient to justify fumigation. The explanation for this is not evident and further work is planned to determine whether or not these soil treatments can be developed for successful practical use.

Exploratory tests have also been made on the possible use of sodium N-methyl dithiocarbamate—Vapam—as a control for sugar-beet nematode. Vapam is soluble in water and has highly effective nematocidal properties. It can be applied in irrigation water or by overhead sprinklers, but it is difficult to obtain an even distribution of the chemical by either method and—what is more important—the cost of Vapam is prohibitive for this purpose.

It is evident from these results that chemical control of the sugar-beet nematode is not practicable under the conditions of these tests.

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## OAT HAY

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two critical times for harvest. Apparently the total nutrients realized from oats are greater at about 18%–20% flowering. Although the yield of dry matter has increased rapidly to this time lignification has not yet adversely influenced utilization. If situations prevent harvesting oat forage at 20% bloom, the forage should be allowed to mature to the dough stage rather than harvested at an in-between milk stage.

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