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*Department of Dairy Husbandry*
*and Caldwell Substation*

# Alfalfa Seed Screenings as a Feed for Dairy Cows

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# Alfalfa Seed Screenings as a Feed for Dairy Cows

*By*
F. W. ATKESON, T. R. WARREN, and R. F. JOHNSON*

SMALL-SEED production is an important industry in Idaho. During the 5-year period, 1929-1933, alfalfa seed production averaged 109,940 bushels annually (3 and 4)†. Clover seed produced in the same period averaged 133,680 bushels (3 and 4). The combined annual production of these two crops averaged 243,620 bushels. Alfalfa and clover seed must be cleaned before they are placed on the market for seed. Screenings removed in the cleaning process average at least 15 per cent of the original seed crop, according to the estimate of one seed buyer. Another extensive buyer estimated 25 per cent. Based on these estimates the quantity of alfalfa seed screenings available annually has been on the average between 1,000,000 and 1,500,000 pounds, or 500 to 800 tons. Similarly, the screenings available from clover seed have been from 600 to 1,000 tons yearly.

The quantity available annually justifies investigation of the value of screenings as a feed for livestock. During the winter of 1931 the price of this by-product feed was 35 cents per hundred pounds, the purchaser furnishing the sacks. Seven dollars per ton for a concentrate feed is very attractive to livestock feeders.

Sheepmen have used screenings quite extensively. Rinehart, Hickman, and Johnson (6) of the Idaho Agricultural Experiment Station conducted four trials using alfalfa seed screenings for fattening lambs. In order to have a more standard product they used recleaned screenings, unground. They report that when the screenings were added to a ration of barley and alfalfa hay one ton of screenings replaced 1762 pounds of barley and 1726 pounds of alfalfa hay. "The addition of alfalfa seed screenings increased the rate of gain 13.8 per cent and improved the finish, all lots proving superior on the market to the alfalfa-barley fed lambs," they reported.

Some dairymen located in the small-seed producing sections of the state have been feeding screenings apparently with good results, but no experiments pertaining to the use of alfalfa seed screenings as a feed for dairy cows have been reported. Alfalfa seed screenings were compared with linseed

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†Figures in parentheses refer to list of literature cited, page 15.

meal for dairy cows in the two trials herein reported, one trial being conducted at the home station in Moscow and the other at the Substation in Caldwell. Although alfalfa seed screenings were used in these trials, it might be expected that somewhat similar results could be obtained with clover seed screenings.

### Composition of Alfalfa Seed Screenings

Reports on the analyses of seven samples received over a period of years are presented in Table I. According to these analyses alfalfa seed screenings should be classed as a high protein concentrate feed, slightly higher than pea meal and cocoanut meal, but lower than linseed meal and cottonseed meal. For comparison, typical analyses of some other high protein feeds are also presented in the table.

The first three samples listed represent the screenings used in the lamb feeding trials previously mentioned. Very little material other than alfalfa seed remained in the screenings after recleaning. Taken as a group these three recleaned samples were higher in protein than the machine-run screenings. The last two samples listed in Table I were the screenings used in this investigation.

### Description of Alfalfa Seed Screenings

Alfalfa seed screenings consist of the material screened out from field threshed alfalfa seed. Shriveled green alfalfa seeds and light weight brown seeds make up the bulk of the screenings. In addition, the screenings contain varying amounts of weed seeds, alfalfa leaves, fine bits of stems, broken grain seeds, chaff, etc.

Some idea of the possible variation in the quality of screenings may be obtained from the description of three samples obtained from a seed company previous to the purchase of a supply for the feeding trial. The samples were taken from three different lots of screenings that happened to be in the same warehouse at that time.

Sample I appeared on casual inspection, to be a fairly good sample of alfalfa seed. Careful examination, however, showed that the sample consisted primarily of immature, light weight seeds, with very few weed seeds and practically no chaff. The sample weighed 58 pounds per bushel.

About 50 per cent of sample II was finely ground leaves and stems, the remainder consisting of light brown alfalfa seeds with a small percentage of fairly plump seeds. The sample contained a few weed seeds, primarily Russian thistle. The weight per bushel was 39 pounds.

## TABLE I

### Chemical Analyses of Alfalfa Seed Screenings

(In per cent)

| Sample No. | Water | Ash | Crude Protein | Carbohydrates | | Fat | |
|---|---|---|---|---|---|---|---|
| | | | | Fiber | N-free extract | | |
| 5101 | 10.0 | 4.96 | 31.51 | 11.31 | 31.21 | 11.02 | Recleaned |
| 5315 | 10.45 | 4.50 | 31.70 | 11.84 | 32.11 | 9.40 | Recleaned |
| 5435 | 11.0 | 5.22 | 34.55 | 10.39 | 29.67 | 9.17 | Recleaned |
| 2220 | 7.75 | 4.33 | 32.92 | 8.42 | 35.21 | 11.37 | |
| 2254 | 8.35 | 4.93 | 26.69 | 12.67 | 40.07 | 7.29 | |
| 6423 | 8.81 | 6.21 | 26.80 | 12.35 | 36.32 | 9.44 | Moscow trial; not cleaned |
| 6429 | 10.00 | 7.06 | 27.00 | 11.90 | 34.68 | 11.90 | Caldwell trial; not cleaned |
| Wheat bran* | 10.1 | 6.3 | 16.0 | 9.5 | 53.7 | 4.4 | |
| Cocoanut meal* old process | 10.2 | 5.6 | 20.7 | 10.3 | 44.8 | 8.4 | |
| Field peas* | 9.2 | 3.4 | 22.9 | 5.6 | 57.8 | 1.1 | |
| Linseed meal* old process | 9.1 | 5.4 | 33.9 | 8.4 | 35.7 | 7.5 | |
| Cottonseed meal* prime | 7.8 | 6.6 | 39.8 | 10.1 | 27.4 | 8.3 | |

*Analyses taken from "Feeds and Feeding," by Henry and Morrison.

NOTE: Determinations made by the Department of Agricultural Chemistry, Idaho Agricultural Experiment Station.

Sample III contained a large percentage of seeds injured by the clover seed chalcid. Brown alfalfa seeds made up the bulk of the sample. It contained more weed seeds than the other two, those most numerous being Russian thistle, spreading amaranth, water grass, and downy brome grass. A trace of brown stems and chaff was evident. The sample weighed 34 pounds per bushel.

Each of these three samples was unusually free from weed seeds.

It would appear from the differences in weight per bushel and in other characteristics that the samples might vary considerably in feeding value. The seed company, however, sold all lots of screenings at the same price, irrespective of quality.

When screenings were ordered for the feeding trials the seed company was requested to send average quality screenings that the results obtained might be typical of what most dairymen could expect. Twelve sacks of screenings, weighing 1240 pounds, were obtained for the trial at Moscow. Eight of the sacks of screenings resembled quite closely sample I described above except that they contained a large percentage of weed seeds. Most of the weed seeds were Russian thistle and pigweed, but a small percentage was water grass and downy brome grass. The alfalfa seeds were about equally divided between shriveled green seeds and light weight brown seeds, with a small percentage of plump green seeds. The other four sacks of seeds were lighter in weight and resembled a mixture of samples II and III described above. About 30 per cent of a composite sample taken from the four sacks was leaves and stems. More than half of the alfalfa seeds were brown, the rest being shriveled green seeds. A considerable percentage of the sample was weed seeds, primarily pigweed and Russian thistle. The sample also contained a small percentage of seeds injured by the clover seed chalcid and a few broken kernels of rye.

The 12 sacks of screenings were thoroughly mixed before being ground in preparation for feeding. When mixed the screenings appeared to be fairly typical of an average lot of machine-run screenings.

### Preparation of Alfalfa Seed Screenings

Many farmers object to feeding alfalfa seed screenings because of the danger of weed infestation when manure is scattered over the fields. Experiments with dairy cows reported by Atkeson, Hulbert, and Warren (1) indicate that

this danger of weed infestation is not so great as might be expected. As a safeguard, however, it is desirable to grind the screenings into a fine powder or flour to insure breaking the seed coats of all small seeds. A further advantage of grinding is that it makes the screenings more completely digestible.

The screenings used in the feeding trial at Moscow were ground in a hammer type mill, using a one-sixteenth-inch mesh screen. A screen of one-eighth inch mesh permitted too many seeds to pass through unbroken. Crowding the capacity of the machine when using the eight-inch screen tended to reduce the speed of the mill and to allow more seeds to pass through unbroken than would be the case were the correct speed maintained. Better grinding resulted when the machine was run at full speed and fed slightly under full capacity. The percentage of unbroken seeds in the screenings used in the Moscow trial was negligible. The screenings used in the feeding trial at Caldwell were ground in a hammer type mill, using a one-eighth-inch mesh screen. After passing through the grinder, about 1 per cent of the seeds remained unbroken. Considering the number of seeds involved, even 1 per cent is larger than is desirable.

To avoid inefficient grinding due to improper equipment or carelessness it might be advisable for the seed cleaning company to grind carefully all screenings before selling or distributing them for feed. By the use of the germination test the company could then guarantee the number of viable seeds not to exceed a specified small percentage. Weight per bushel could be used by the dairyman to avoid purchasing ground screenings containing excessive amounts of stems and chaff. Protein content might be used as a further safeguard if necessary.

Thorough commercial grinding would obviate the menace of distributing weed seeds. It would also make possible the utilization of many tons of weed seeds which otherwise would be a problem in disposal if the screenings were recleaned before being fed. The weed seeds might possibly be just as nutritious as the alfalfa seeds.

### Feeding Trials

Two trials were conducted practically simultaneously: Trial I at the Idaho Agricultural Experiment Station at Moscow and Trial II at the Substation at Caldwell. The conditions under which the two trials were conducted were kept as uniform as possible. Each trial was divided into three 32-day periods. The first 8 days were used as a preliminary or trans-

ition period and the following 24 days as the experimental period.

Two groups of cows were used in each trial. An effort was made to balance the groups as evenly as possible with respect to breed, age, body weight, days in lactation, days in gestation, and daily milk and butterfat production. Ten cows, 6 Holsteins and 4 Jerseys, were selected from the University purebred herd for the trial at Moscow. One of the Holstein cows was dropped from the experiment because of sickness, leaving 5 cows in Group I and 4 in Group II. In the Caldwell trial 8 high-grade Holsteins, 4 cows in each group, were selected from the Substation herd.

All the cows in both trials were fed alfalfa hay and corn silage throughout the experiment, the variant in the ration being the grain mixture. The grain mixture used as a basis for comparison consisted of 400 pounds of rolled barley, 200 pounds of wheat bran, 100 pounds of linseed meal, and 21 pounds of mineral salt. The experimental grain mixture was just the same except that 200 pounds of alfalfa seed screenings were substituted for the 100 pounds of linseed meal. The linseed meal represented 1 part in 7, other than salt, or 14.3 per cent of one mixture; while the screenings represented 2 parts in 8, or 25 per cent of the other mixture. Therefore, on a thousand-pound basis, 250 pounds of screenings replaced 143 pounds of linseed meal, 71 pounds of barley, and 36 pounds of bran.

In compounding these two grain mixtures, preliminary calculations indicated that they would be practically equal in crude protein and total nutrients. When chemical analyses were made, however, they were found to be somewhat different from the preliminary calculations. In the Caldwell trial the crude protein of the two grain mixtures was practically the same, but the screenings mixture contained slightly more total nutrients than the linseed meal mixture. In the Moscow trial the total nutrients of the two rations were quite similar but slightly more protein was contained in the screenings mixture. No digestion coefficients being available for alfalfa seed screenings, comparisons were made on the basis of crude protein and total nutrients rather than digestible nutrients. The weakness of such comparisons, in general, is recognized, but it is thought that the similarity of the feeds might allow these comparisons.

The double reversal system of experimentation was used. Cows in Group I of each trial were fed the oil meal grain mixture during the first and third periods and the alfalfa seed screenings during the second period. Simulta-

## TABLE II

### Chemical Analyses of Feeds Used in the Feeding Trials

(In per cent)

| Kind of Feed | No. of samples | Water | Ash | Crude protein | Carbohydrates | | Fat | Total* nutrients |
|---|---|---|---|---|---|---|---|---|
| | | | | | Crude fiber | N-free extract | | |
| **Moscow Trial** | | | | | | | | |
| Alfalfa hay | 3 | 11.9 | 9.4 | 10.7 | 29.8 | 36.7 | 1.5 | |
| Corn silage | 3 | 76.8 | 1.5 | 1.7 | 6.3 | 13.2 | 0.5 | |
| Alfalfa seed screenings | 1 | 8.8 | 6.2 | 26.8 | 12.4 | 36.3 | 9.5 | 96.9 |
| Linseed meal | 1 | 11.2 | 5.4 | 35.1 | 8.4 | 34.9 | 5.0 | 89.7 |
| Alfalfa seed screenings grain mixture | 1 | 10.6 | 6.7 | 17.8 | 7.1 | 55.0 | 2.8 | 86.2 |
| Linseed meal grain mixture | 1 | 10.6 | 6.3 | 15.5 | 7.1 | 59.2 | 1.3 | 84.7 |
| **Caldwell Trial** | | | | | | | | |
| Alfalfa hay | 3 | 13.7 | 10.5 | 14.8 | 25.3 | 34.1 | 1.6 | |
| Corn silage | 3 | 74.7 | 2.7 | 2.4 | 8.3 | 11.3 | 0.6 | |
| Alfalfa seed screenings | 1 | 10.0 | 7.1 | 27.0 | 11.9 | 34.6 | 9.4 | 94.7 |
| Linseed meal | 1 | 10.5 | 5.8 | 37.5 | 7.6 | 33.7 | 4.9 | 89.8 |
| Alfalfa seed screenings grain mixture | 1 | 9.0 | 5.8 | 15.6 | 8.3 | 57.2 | 4.1 | 90.3 |
| Linseed meal grain mixture | 1 | 9.9 | 6.7 | 15.3 | 7.3 | 57.9 | 2.9 | 87.0 |

*Computed by adding protein, carbohydrates, and fat times 2.25.

NOTE: Determinations made by the Department of Agricultural Chemistry, Idaho Agricultural Experiment Station.

neously, cows in Group II were fed alfalfa seed screenings during the first and third periods and linseed oil meal during the second period.

Before the experiment was begun data were obtained on the daily consumption of alfalfa hay and silage for each cow. From these records the quantity of each of these feeds to be fed daily to each cow was determined. An attempt was made to keep the daily consumption of hay and silage constant for each cow throughout all three periods of the feeding trial. The grain mixtures were fed to the Holstein cows at the rate of one pound of grain to four pounds of milk produced daily. Jerseys were fed at the rate of one to three. Using these ratios the quantity of grain mixture fed was adjusted every sixth day according to the average daily production of the previous six days.

The cows were fed twice daily in stalls equipped to prevent loss of feed. Alfalfa hay was chopped before feeding to minimize waste and prevent the cows from eating the more leafy parts of the hay and leaving the stems. First cutting hay of good quality was fed in both trials. Hay used in the Caldwell trial was grown under irrigation on the Substation farm, while that used in the Moscow trial was non-irrigated, local hay. Corn silage grown on the college farm, and typical in quality for the area, was used at Moscow. The corn silage used at Caldwell was grown on the Substation farm and was of fair quality. Barley and bran used were representative of each area. Old process linseed meal of good quality was used. Alfalfa seed screenings fed have been previously discussed. The mineral mixture used in both trials consisted, by weight, of one-third common salt, one-third finely ground limestone, one-sixth steamed bone meal, one-sixth spent bone black, and one-tenth of 1 per cent of iodized calcium.

All feed given to individual cows and all feed refused by each was weighed and sampled for chemical analysis. Composite samples of alfalfa hay, corn silage, and refused feed were analyzed for moisture every eight days. The three samples thus obtained were combined and carefully sampled for complete analysis. Composite samples of the linseed meal grain mixture and the screenings mixture were analyzed for each trial. To facilitate comparison of linseed meal and screenings they were also analyzed individually. Any feeds refused were deducted from those fed before the nutrients consumed were calculated.

The cows were allowed to exercise in a dry lot about two hours daily. Water was supplied in the Moscow trial in individual drinking cups attached to the stalls. At Caldwell the

cows were watered twice daily from an outside tank of heated water. Each cow was weighed at the beginning of the experiment three successive mornings between 7 and 8 o'clock. They were also weighed the last three days of each preliminary or transition period, and the last three days of each 24-day experimental period. The average of the three successive daily weights was considered the true weight. Daily milk production was recorded and composite samples for butterfat analysis were kept for each cow during each 8 days of the 24-day experimental periods.

## Results

The results, for the sake of brevity, are presented as a summary by groups (Table III). The average of the first and third periods was compared with the second period in all instances to offset the natural decline in production caused by advance in lactation as the experiment progressed. Total nutrients consumed, computed from the chemical analyses, are presented in lieu of total digestible nutrients. It is recognized that they are not so accurate as digestible nutrients in measuring the nutrients available for the cow's use, but the similarity of the two feeds might permit their use in the absence of digestion coefficients for screenings.

For each group in both trials the average daily consumption of feeds per cow while on the screenings ration was quite similar to feed consumption while on the linseed meal ration. When on the screenings ration the cows consumed slightly more protein than when on the linseed meal ration. The cows consumed approximately the same amount of total nutrients on both rations.

When the nine cows in the two groups of the Moscow trial were averaged on a daily basis, the milk production per cow was 28.7 pounds when the oil meal ration was fed and 29.0 pounds when alfalfa seed screenings were fed. The butter-fat production was found to be exactly the same, 1.12 pounds.

Daily milk production was also averaged on a "fat-corrected-milk" basis as 4 per cent milk (5). The purpose of presenting this calculation is to combine into one figure the total energy output in milk and butterfat. This figure is obtained by multiplying the pounds of milk by 0.4 and adding this result to the pounds of fat multiplied by 15. Computed in this manner the average daily production of the 9 cows was 28.3 pounds of 4 per cent milk while on the oil meal ration, and 28.4 pounds when alfalfa seed screenings were fed.

## TABLE III

**Results of Two Feeding Trials Comparing Alfalfa Seed Screenings With Linseed Meal for Dairy Cows**

| | Moscow Trial | | | | | | Caldwell Trial | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Group I | | Group II | | Both groups weighted ave. | | Group I | | Group II | | Both groups weighted ave. | |
| | Lin. meal ration | Alf. scr. ration | Lin. meal ration | Alf. scr. ration | Lin. meal ration | Alf. scr. ration | Lin. meal ration | Alf. scr. ration | Lin. meal ration | Alf. scr. ration | Lin. meal ration | Alf. scr. ration |
| Period | II | I & III ave. | I & III ave. | II | | | II | I & III ave. | I & III ave. | II | | |
| Number of cows used | 5 | 5 | 4 | 4 | 9 | 9 | 4 | 4 | 4 | 4 | 8 | 8 |
| Ave. lbs. of silage consumed daily per cow | 32.6 | 30.6 | 31.4 | 32.4 | 32.1 | 31.4 | 39.2 | 39.0 | 41.2 | 38.3 | 40.2 | 38.7 |
| Ave. lbs. of hay consumed daily per cow | 17.0 | 17.5 | 17.2 | 16.7 | 17.1 | 17.2 | 19.2 | 18.8 | 19.1 | 17.4 | 19.4 | 18.1 |
| Ave. lbs. of grain mixture consumed daily per cow | 8.6 | 8.2 | 8.3 | 8.3 | 8.5 | 8.2 | 7.6 | 6.8 | 7.3 | 7.7 | 7.5 | 7.3 |
| Ave. lbs. of milk produced daily per cow | 30.1 | 30.5 | 27.2 | 27.3 | 28.7 | 29.0 | 29.8 | 28.4 | 31.0 | 32.0 | 30.4 | 30.2 |
| Ave. lbs. of butterfat produced daily per cow | 1.08 | 1.08 | 1.16 | 1.18 | 1.12 | 1.12 | 0.98 | 0.96 | 0.99 | 1.01 | 0.98 | 0.99 |
| Ave. percentage fat in milk | 3.59 | 3.54 | 4.26 | 4.32 | 3.90 | 3.86 | 3.29 | 3.38 | 3.19 | 3.16 | 3.22 | 3.28 |
| Ave. lbs. of 4 per cent milk* produced daily | 28.2 | 28.4 | 28.3 | 28.6 | 28.3 | 28.4 | 26.6 | 25.8 | 27.3 | 28.0 | 26.9 | 26.9 |
| Ave. body weight per cow at beginning (lbs.) | 1203 | 1222 | 1100 | 1100 | 1157 | 1168 | 1250 | 1239 | 1209 | 1224 | 1230 | 1232 |
| Ave. gain per cow in body wt. per 24-day period (lbs.) | +29 | + 6 | +16 | +17 | +23 | +11 | +14 | +12 | +20 | + 8 | +17 | +10 |
| Ave. lbs. of crude protein consumed daily per cow | 3.7 | 3.8 | 3.7 | 3.8 | 3.7 | 3.8 | 4.9 | 4.8 | 4.9 | 4.7 | 4.9 | 4.7 |
| Ave. lbs. total nutrients consumed daily per cow | 28.8 | 28.0 | 27.8 | 27.8 | 28.9 | 27 9 | 30.7 | 29.8 | 30.8 | 29.4 | 30.7 | 29.6 |

*"Fat-Corrected Milk," Bulletin No. 245, Illinois Agricultural Experiment Station.

Differences in food consumption and in production would seem to be within the limits of experimental error. The cows increased slightly in body weight on both rations. In 24-day periods the gain was 23 pounds on the oil meal ration and 11 pounds on the alfalfa seed screenings. These increases do not appear very significant because a variation of 14 pounds due to chance may be expected when animals are weighed three consecutive days under standard conditions (2).

Cows in the Caldwell trial consumed slightly more nutrients daily and produced a little less than those in the Moscow trial. Food intake, production of milk and butterfat, and change in body weight were all quite similar within each group when on both rations. When the 8 cows in the two groups were averaged together, the daily production per cow was 30.4 pounds of milk and 0.98 pounds of fat while on the linseed meal ration and 30.2 pounds of milk and 0.99 pounds of fat when on the alfalfa seed screenings ration. The "fat-corrected-milk," that is, 4 per cent milk, was the same, 26.9 pounds daily, on both rations. Body weight changes of 17 pounds and 10 pounds respectively on the two rations are not significant differences.

The results of these two trials, representing 4 groups of cows, or a total of 17 cows, indicate that alfalfa seed screenings may be used to good advantage as a feed for dairy cows. Equally good results were obtained when 200 pounds of alfalfa seed screenings were substituted for 100 pounds of linseed meal as a protein supplement to 400 pounds of barley and 200 pounds of wheat bran. On a thousand-pound basis, 250 pounds of screenings replaced 143 pounds of linseed meal, 71 pounds of barley, and 36 pounds of bran.

### Palatability

No attempts were made to measure the palatability of ground alfalfa seed screenings. Observation of the cows used in the trial, however, indicated that most of the cows readily ate the screenings grain mixture, a fourth of which was alfalfa seed screenings. One Jersey cow originally selected for the experiment was not used because she refused to eat the screenings-grain mixture. Another Jersey cow used in the experiment did not seem to relish the mixture, but she was fed a comparatively large amount of grain daily because of her high production.

A few dairymen in southern Idaho have been authentically reported to have maintained high average herd producton when alfalfa seed screenings were fed as the only feed other than alfalfa hay. When no other grain is offered, the

cows may be forced or taught to eat feeds which they might not relish. Since alfalfa seed screenings are high in protein, feeding them mixed with low protein home-grown grains would seem more judicious than feeding them alone.

Although alfalfa seed screenings are probably not relished so much as feeds such as barley and wheat bran, it would seem that palatability should not be a limiting factor in their use as a feed for dairy cows.

## Summary and Conclusions

From 500 to 800 tons of alfalfa seed screenings and 600 to 1000 tons of clover seed screenings are available annually for livestock feed in Idaho. Chemical analyses of alfalfa seed screenings indicate that this by-product contains 26 per cent or more of crude protein.

Alfalfa seed screenings are composed primarily of shriveled green alfalfa seeds, light weight brown seeds, and hollow seeds caused by the clover seed chalcid. In addition they contain variable amounts of weed seeds, alfalfa leaves, fine bits of stems, and chaff. The quality of these screenings is quite variable.

Screenings should be ground to a fine powder or flour to make them more digestible and to obviate the menace of weed infestation when manure is scattered over the fields.

Alfalfa seed screenings were compared with linseed meal in two feeding trials in which 17 cows were used. Alfalfa hay and corn silage were fed throughout the trials. A grain mixture of 400 pounds of barley, 200 pounds of wheat bran, 100 pounds of linseed meal, and 21 pounds of mineral salt was compared with a mixture of 400 pounds of barley, 200 pounds of wheat bran, 200 pounds of alfalfa seed screenings, and 21 pounds of mineral salt.

The two grain mixtures were fairly equal in crude protein and total nutrient content. The screenings used were machine-run, without any recleaning.

The results indicate that alfalfa seed screenings may be used to good advantage as a feed for dairy cows. When 200 pounds of alfalfa seed screenings were substituted for 100 pounds of linseed meal as a protein supplement to 400 pounds of barley and 200 pounds of wheat bran, the results were equal to those obtained when the linseed meal was used. On a thousand-pound basis, 250 pounds of screenings replaced 143 pounds of linseed meal, 71 pounds of barley, and 36 pounds of bran.

Although alfalfa seed screenings are probably not relished so much as many common feeds, palatability would not be a limiting factor when they are fed as 25 per cent of the grain ration.

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