Table 4.—Soybean meal and combinations of soybean meal and cottonseed meal as protein supplements to a milo ration for swine.

(All rations 14% protein throughout the trial)
Summer 1956

Rations[1] [2]	I All S.B.M.	II ⅔ SBM-⅓ CSM	III ½ SBM-½ CSM	IV ⅓ SBM ⅔ CSM	V All CSM
Kafir 4414	82.4	82.2	82.1	81.9	81.5
Soybean meal	9.7	6.6	5.0	3.4	----
Cottonseed meal[3]	----	3.3	5.0	6.8	10.6
Alfalfa meal	5.0	5.0	5.0	5.0	5.0
Bone meal	2.0	2.0	2.0	2.0	2.0
Salt	0.5	0.5	0.5	0.5	0.5
Aurofac[4]	0.3	0.3	0.3	0.3	0.3
Fortafeed[5]	0.1	0.1	0.1	0.1	0.1
Total ration	100.0	100.0	100.0	100.0	100.0
Ration cost per cwt. $	2.76	2.75	2.75	2.75	2.75
Pigs per lot	8	8	8	8	8
Av. initial wt. (lbs.)	78.8	78.8	78.4	78.4	78.4
Av. Final wt. (lbs.)	193.5	193.4	190.9	188.5	181.6
Av. daily gain (lbs.)	1.48	1.53	1.49	1.34	1.19
Av. feed required per cwt. gain (lbs.)	370.8	370.8	392.8	398.9	404.5
Feed cost/Lb. gain (cents)	10.23	10.20	10.80	10.97	11.12

[1] 0.02 percent zinc sulfate was added to all rations for the prevention of parakeratosis.
[2] The Kafir 4414, soybean meal, cottonseed meal and alfalfa meal contained 10.78, 43.75, 41.00, and 17.34 percent protein, respectively.
[3] High quality, prepressed, solvent extracted, low gossypol meal with a high nitrogen solubility.
[4] Supplies 10.8 grams of aureomycin and 10.8 mg. of vitamin B_{12} per ton of ration.
[5] Supplies 4.0 gms. of riboflavin, 8.0 gms. of pantothenic acid, 18.0 gms. of niacin and 80.0 gms. of choline chloride per ton of ration.

in the 1955-56 Feeder's Day Report emphasized the dangers from feeding as little as 7.8 percent of a high gossypol cottonseed meal.

On the basis of a cost of $3.45 per hundred for soybean meal and $3.30 per hundred for cottonseed meal, as used in this test, there is little economic advantage for feeding a mixture of three parts of soybean meal and one part cottonseed meal. With a greater spread in price between these two feeds, there would be an economic advantage of feeding the combination over the soybean meal alone.

Urea in Protein Supplements for Wintering Beef Cattle

A. B. NELSON, M. G. GREELEY and W. D. CAMPBELL

Because of the complex nature of the ruminant stomach, cattle and sheep are able to utilize, to varying degrees, the nitrogen from urea and other non-protein nitrogen compounds. This utilization is possible because of the microorganisms in parts of the ruminant stomach. The utilization of non-protein nitrogen is apparently affected, therefore, by

the nutrition of the microorganisms. Efficient utilization of urea may result only when other nutrients are provided in needed amounts.

There have been many studies which indicate that urea may satisfactorily replace part of the protein in the rations of fattening cattle. There is a lesser number of tests on the value of urea in wintering rations in which the quantity of concentrate feed offered as a supplement to grass hays or dry, native grass pastures is very limited.

In a test conducted by the Oklahoma Agricultural Experiment Station during the 1953-54 winter season, heifer calves fed 2 lbs. per head daily of a feed having 50 percent of the nitrogen furnished by urea as a supplement to dry, native grass lost more weight than similar heifers fed the basal ration. The basal supplement was a mixture of corn and cottonseed meal and contained approximately 20 percent protein. The supplement containing urea was the basal supplement plus sufficient urea to make the nitrogen content equivalent to 40 percent protein. A third supplement was pelleted cottonseed meal (40 percent protein). Also, the calcium and phosphorus contents were equalized. The average gain per heifer (20 per lot) during the 152-day wintering period was -5, -15, and -33 lbs. for those fed the 40 percent protein, 20 percent protein, and 40 percent protein supplement containing urea, respectively. This indicated little, if any, utilization of urea.

During the 1954-55 winter feeding season, heifer calves grazing native grass were fed an average of 2 lbs. per head daily of a 20 percent protein supplement, a 40 percent protein supplement with 50 percent of the nitrogen furnished by urea, or the 40 percent protein supplement with urea plus trace minerals. The winter gains of these heifers were 31, 6 and 53 lbs., respectively. This indicated utilization of urea when additional trace minerals were included in the ration.

Two tests were conducted during the 1955-56 winter feeding season. In the first test, yearlings (steers and heifers) grazed the native grass pastures and were fed 2 lbs. per head daily of a 28 percent protein supplement, a 40 percent protein supplement, a 40 percent protein supplement with one-third of the nitrogen furnished by urea (28 percent protein supplement plus urea), or a 40 percent protein supplement containing urea plus trace minerals. The gains of these cattle were -54, -2, -62 and -45 lbs., respectively. Apparently little, if any, of the urea in the pellets was utilized, although the addition of trace minerals to the urea-containing pellet resulted in slightly less loss than when the trace minerals were not added.

In a second test in 1955-56, steer calves were fed prairie hay. The supplements, fed at the rate of 1 lb. per head daily, were: 40 (basal), 40 percent protein supplement containing urea, or this latter supplement plus trace minerals. Gains were 82, 70 and 78 lbs., respectively. The gains varied only slightly, indicating utilization of urea in a pellet fed as a supplement to prairie hay.

The chemical composition of the pelleted supplements and prairie hay fed during the 1956-57 winter feeding season is given in Table 1.

Table 1.—Chemical composition of supplements and prairie hay.

	Percent Dry Matter	Percentage composition of dry matter						
		Ash	Protein	Fat	Fiber	N.F.E.	Ca	P
40-CSM	92.89	8.62	43.46	3.43	10.41	34.08	0.94	0.66
40-Urea	91.59	8.05	45.04	3.60	8.29	35.02	0.96	0.70
40-Urea + trace minerals	91.72	7.93	44.63	4.19	9.04	34.21	0.97	0.69
40-Urea + dehy. alfalfa meal	91.59	8.33	45.34	4.03	11.48	30.82	0.97	0.68
Prairie Hay	94.85	6.61	4.59	1.68	35.27	51.85	0.40	0.08

Trial 1, Yearling Heifers Grazing Native Grass

Fifty-one grade Hereford yearling heifers were divided into 3 lots of 17 each and were allowed to graze the native grass pastures on the south side of Lake Carl Blackwell. In addition to the dried grass, they were fed an average of 2 lbs. per head daily of the following protein supplements starting November 10, 1956:

Lot 1. 40 percent protein supplement.

Lot 2. 40 percent protein supplement containing urea.

Lot 3. Same as Lot 2 plus trace minerals.

The 40 percent protein supplement was 97.9 percent cottonseed meal, 1.1 percent dicalcium phosphate and 1.0 percent monosodium phosphate. The latter two ingredients were added at such rates that the calcium and phosphorus contents of all pellets were approximately equal. The 40 percent protein supplement containing urea was 59 percent cottonseed meal, 33 percent ground yellow corn, 5 percent urea* and 3 percent dicalcium phosphate. Urea furnished approximately one-third of the nitrogen in this pellet. The third supplement was the same as that fed to Lot 2 except trace minerals** were added at the rate of 0.1 lb. per 100 lbs. of the supplement. According to the manufacturers' recommendations the additional minerals provided were, in mgs. per pound of pelleted supplement: manganese, 55.0; iodine, 1.76; cobalt, 1.18; iron, 36.6; copper, 3.3; and zinc, 3.04. At the rate fed the trace minerals cost only 1-2 cents per head during the winter.

All pelleted supplements were fed every other day. A mixture of 2 parts salt and 1 part steamed bone meal was available in all lots.

*Urea was provided by Nitrogen Division, Allied Chemical and Dye Corporation.
**Commercial mixture provided by Calcium Carbonate Company.

The cost of the various pellets was calculated from the cost of the several feed ingredients plus a mixing and pelleting charge of $5 per ton. On this basis the costs per ton were as follows: 40 percent protein supplement, $73.86; 40 percent protein supplement containing urea, $73.26; and supplement containing urea and trace minerals, $73.30.

Results

The heifers fed the cottonseed meal pellet (Lot 1) lost 35 lbs. (Table 2) in the 118-day wintering period. When one-third of the nitrogen in the supplement was supplied by urea the heifers (Lot 2) lost 96 lbs. per head. This would indicate little apparent utilization of urea. However, when a trace mineral mixture was included in the supplemental feed, the loss was 30 lbs. or approximately the same as that of the control heifers (Lot 1). Apparently the trace minerals provided were lacking in the range grass and the urea-containing pellet fed to Lot 2.

Table 2.—Urea in protein supplements for wintering yearling heifers grazing native grass (118 days).

	Lot 1 40-CSM	Lot 2 40-Urea	Lot 3 40-Urea + trace minerals
Number of animals[1]	16	16	17
Average weight per head (lbs.)			
Initial 11-10-56	727	726	736
Final 3-8-57	692	630	706
Gain	—35	—96	—30
Daily gain	— 0.30	— 0.81	— 0.25
Supplemental feed cost per head[2] ($)	8.72	8.64	8.65

[1] There were originally 17 heifers per lot but 1 in each of Lots 1 and 2 were removed when they were found to be pregnant.
[2] Two lbs. of supplement per head daily. Added feed costs would be $4 per head for winter grazing and $.12 for minerals which were consumed at the rate of .05 lb. per day.

Trial 2, Steer Calves Grazing Native Grass

Forty grade Hereford steer calves were divided into 4 lots of 10 head each on November 13, 1956. They were allowed to graze the dry native grass in the pastures on the south side of Lake Carl Blackwell and were fed an average of 2 lbs. per head daily of the following supplements:

Lot 1. 40 percent protein supplement.

Lot 2. 40 percent protein supplement containing urea.

Lot 3. Same as Lot 2 plus trace minerals.

Lot 4. Same as Lot 2 plus dehydrated alfalfa meal.

The supplements fed to Lots 1, 2 and 3 were as described in Trial 1. The supplement fed to Lot 4 was 56 percent cottonseed meal, 26

percent corn, 5 percent urea, 10 percent dehydrated alfalfa meal, 2.5 percent dicalcium phosphate and 0.5 percent monosodium phosphate. The two phosphates were added in order to equalize the contents of calcium and phosphorus in all pellets. This pellet cost $74.36 per ton. As in Trial 1, twice the daily ration was fed every other day. A mixture of 2 parts salt and 1 part steamed bone meal was available in all lots.

Results

A summary of the weight gain and feed cost is given in Table 3. The greatest gain (60 lbs.) was made by those steers fed the basal ration of pelleted cottonseed meal (Lot 1). As was true in Trial 1, the steers utilized little, if any, of the urea fed to Lot 2. These steers gained only 4 lbs. in the 115-day test. The addition of trace minerals or dehydrated alfalfa meal apparently increased the utilization of urea as measured by weight gain of the steers. The gains were 34 and 36 lbs. for additional trace minerals and dehydrated alfalfa meal, respectively. The utilization was not complete, however, because these gains were approximately 25 lbs. less than the gains the steers fed pelleted cottonseed meal in Lot 1.

Table 3.—Urea in protein supplements for wintering steer calves grazing native grass (115 days).

	40-CSM Lot 1	Lot 2 40-Urea	Lot 3 40-Urea + trace minerals	Lot 4 40-Urea + dehy. alf. meal
Average weight per steer (lbs.) Initial 11-13-56	456	456	458	455
Final 3-8-57	516	460	493	491
Gain	60	4	34	36
Daily gain	0.52	0.03	0.28	0.31
Supplemental feed cost per head[1] ($)	8.49	8.42	8.43	8.55

[1] Two lbs. of supplement per head daily. Added feed costs would be $3 per head for winter grazing and $.10 for minerals which were consumed at the rate of .04 lb. per day.

Trial 3, Heifer Calves Fed Prairie Hay

In Trials 1 and 2, cattle have been wintered on dry range grass and pelleted supplements. In Trial 3, the roughage was prairie hay. Prairie hay is known to contain more protein and phosphorus than dry range grass. Its composition of these and other nutrients makes prairie hay of greater feeding value than dry range grass.

On November 15, 1956, sixty heifer calves were divided into 6 lots of 10 head each. They were fed prairie hay and an average of 1 lb. per head daily of the following supplements:

Lots 1 and 2. 40 percent protein supplement.

Lots 3 and 4. 40 percent protein supplement containing urea.
Lots 5 and 6. Same as Lots 3 and 4 plus trace minerals.

These supplements were as described in Trial 1. A mixture of 2 parts salt and 1 part steamed bone meal was available in all lots. Because physical facilities (insufficient water in some ponds) did not permit the feeding of 6 separate lots of cattle, the two lots fed each supplement were combined and fed as 3 groups of 20 head each. All lots of heifers were fed approximately the same quantity of hay. Weight data for the different lots are kept separate in order to allow study of the variation among two groups of animals fed alike. The results are summarized in Table 4.

Table 4.—Urea in protein supplements for wintering heifer calves fed prairie hay (133 days).

	40-CSM		40-Urea		40-Urea & trace minerals	
	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Number per lot	10	10	10	10	10	9
Average weight per head (lbs.)						
Initial 11-15-56	448	448	448	448	448	439
Final 3-28-57	540	552	529	529	537	522
Gain	92	104	81	81	89	83
Daily gain	0.69	0.78	0.61	0.61	0.67	0.62
Average daily feed per head (lbs.)						
Prairie hay[1]	14.9	14.9	14.9	14.9	14.9	14.9
Protein supplement	1.0	1.0	1.0	1.0	1.0	1.0
Mineral	0.04	0.04	0.04	0.04	0.04	0.04
Feed cost per head[2] ($)	29.81	29.81	29.77	29.77	29.78	29.78

[1] An equal number of bales of prairie hay was fed to each group. Several bales were weighed periodically for calculation of the average weight per bale.
[2] Pellets cost $73.86, $73.26, and $73.30 per ton in Lots 1, 2, and 3, respectively.

Results

The addition of trace minerals to a pellet containing urea which was fed as a supplement to prairie hay apparently increased the utilization of urea only slightly, if at all. The gain (86 lbs.) of these cattle fed additional trace minerals was only an average of 5 lbs. greater than the gain of heifers fed the urea-containing supplement without trace minerals. The gains of the heifers fed pelleted cottonseed meal (Lots 1 and 2) were 92 and 104 lbs., which are slightly greater than the gains in the other lots. Urea was apparently at least partially utilized by the heifers in Lots 3, 4, 5 and 6.

The average winter gains of the two groups of heifers fed the same supplement were nearly the same.

Summary

Urea is apparently not utilized by cattle wintered on dry range grass when it is added to a mixture of corn and cottonseed meal to

produce a pellet containing 40 percent protein with one-third of the nitrogen furnished by urea. However, the addition of trace minerals to the urea-containing pellet results in increased gains indicating increased utilization. Prairie hay apparently furnishes nutrients not present in dry range grass, because the addition of trace minerals to a urea-containing pellet fed as a supplement to prairie hay did not result in increased gains. These results are in agreement with the results of previous tests and indicate that considerable attention must be given to trace minerals and nutrients furnished by a small quantity of dehydrated alfalfa meal when formulating supplements containing urea.

Grub Control with Dow ET-57, A Recently Developed Systemic Insecticide[1]

D. E. HOWELL

Estimates of the losses caused by cattle grubs in the United States vary from $100 million to $300 million annually. The loss in Oklahoma approaches $12 million. Current control measures for this serious pest require at least three applications of rotenone as a spray, wash or dust at monthly intervals from December to March. Unfortunately, much of the damage has been done by the grubs before control can be accomplished with rotenone as it is effective only after the grubs have cut through the hide late in their larval life. Phenothiazine was reported to be effective in controlling grubs and internal parasites by low level feeding but extensive tests at this Station indicated it did not provide appreciable grub control. Preliminary results in 1955-56 with a newly developed organic phosphate systemic were so encouraging that large-scale cooperative tests were established in several parts of the State.

The insecticide used was developed by the Dow Chemical Company and formulated as a drench, bolus (elongated pill) or capsule. Chemically the material is O,O-dimethyl O-2, 4, 5-trichlorophenyl phosphorothioate commonly called Dow ET-57. It was used at the rate of approximately 100 mg./kg., roughly 1.6 oz. of pure material for a thousand pound cow. The insecticide was given before the grubs had appeared in the backs of the cattle.

Grub control tests involving 1,498 animals were superimposed on genetics, feeding, or management experiments at Stillwater, Lake Carl Blackwell, Fort Reno, Fort Supply, and Coalgate by treating half of each group. The other half was left untreated as a check. A test under ranch conditions was carried on with the cooperation of the Codding brothers at Foraker, Oklahoma.

The effectiveness of the insecticide was determined by comparing the number of grubs in the backs of treated animals with those in the untreated group at monthly intervals during the grub season.

[1] This cooperative work involved the Oklahoma A & M College Departments of Agronomy, Animal Husbandry, and Entomology; Ft. Reno and Southern Great Plains Field Station Range Unit at Fort Supply.