Further Gleamings from the Director's Annual Report

LIVESTOCK QUESTIONS

Do dairy heifers require protected winter housing or can they be safely house in open sheds?

The Department of Dairy Husbandry (J. R. Dice) reports four years of comparisons of gains in weight made by heifers housed in open sheds as compared to their gains in weight and their comparative feed consumption under the warmer, more protected housing conditions. Dice finds that yearling heifers in a closed shed in which moderate temperatures prevailed gain slightly more in weight and height at withers than heifers kept in an open shed at cold temperatures. Heifers housed in the open shed consumed more protein and more total nutrients per pound of gain than the heifers in the closed, warmer shed.

Turkey Questions

Have the experiments on free selection of feeds by growing turkeys indicated any feeds worthy of greater consideration by turkey producers?

The Station Poultry Husbandman (G. P. Goodearl) finds that the amounts of proso (a grain millet) and of emmer (speltz) consumed indicate that these two feeds deserve more consideration.

Is is necessary to mix feeds for turkeys?

G. P. Goodearl, Poultry Husbandman, concludes on the basis of three-years' work that turkeys fed all ingredients separately from 8 weeks to 28 weeks of age attained as great a final weight, made as good gains in weight, ate less feed, and finished in as good a market condition as those turkeys fed a mixed mash and mixed grain through the same period. In other words, if the turkeys have access to a variety of feeds they will do a good job of mixing the necessary ingredients in their own choice of diet.

Will increasing the niacin content (nicotinic acid) of a ration fed to pigs increase the content of this vitamin in the body of the pig?

Increasing the niacin content of the ration fed to pigs **in excess of the normal requirements** causes an increase in the content of this vitamin in the animal's tissues. Results obtained in 1942 were confirmed by additional results obtained in 1943. This research is in charge of F. W. Christensen, Animal and Human Nutritionist, as leader, assisted by M. I. Wegner, Assistant Animal Nutritionist, Eunice Kelly, Human Nutritionist, J. H. Longwell, Chief in Animal Industry.

What is the effect of the degree of winter feeding of calves upon their later gains on pasture?

The Department of Animal Husbandry (J. H. Longwell) fed two lots of 10 grade Hereford calves from December 9, 1942, until they were turned on pasture on May 29, 1943. The "limited-fed" lot received hay, corn, silage, and a grain mixture of one-third ground barley, and two-thirds ground oats, with one-half pound of linseed oil meal per head daily and gained about 0.40 pound daily. The "liberally-fed" lot were fed the same ration but allowed to eat enough more of it so that they made winter gains of about 0.80 pounds daily. Both lots of calves were turned into pasture May 29, 1943, and pastured until September 15, 1943, when they were weighed and graded. The "limited fed" lot made greater gains on pasture, but not enough to equal the total winter and summer gains of the "liberally-fed" lot. The following short table tells the story:

	Average Gains Per Head "Limited-fed lot"	"Liberally-fed lot"
Winter gains	61 lbs.	132 lbs.
Pasture gains	151 lbs.	130 lbs.
Total gains	212 lbs.	262 lbs.
Feed Consumed During the Winter Per 100 Pounds of Gain.		
Hay (crested wheat)	436 lbs.	509 lbs.
Silage (corn)	566 lbs.	254 lbs.
Grain	1142 lbs.	689 lbs.

QUESTIONS ABOUT VEGETABLES AND FRUIT

Are canned tomatoes a good source of Vitamin C?

Extensive trials by the Department of Animal and Human Nutrition and cooperating departments have demonstrated that freshly canned tomatoes are a good source of Vitamin C. Tests of the Vitamin C content of tomatoes canned in September 1942 and stored until March 1943 indicated that hot pack tomatoes showed a greater decrease in Vitamin C than the cold pack tomatoes. In two years' determinations (September 1942 and September 1943) of the Vitamin C content of fresh tomatoes there was no consistent difference in the Vitamin C content of the four varieties Orange King, Bison, Firesteel, and Bounty. In fact, in 1943, when somewhat greater precautions were taken in preparation of the samples, the four varieties showed no significant variation in Vitamin C content.

What amounts of riboflavin may we expect to find in North Dakota grown vegetables?

In preliminary trials M. I. Wegner and Eunice Kelly (Department of Animal and Human Nutrition) have determined the riboflavin content of two varieties of peas, four varieties of beans, and one variety of sweet corn.

The following table based upon dry weight of the samples gives the riboflavin in micrograms per gram of raw, cooked, and blanched samples of the 1943 crop.

The method used for riboflavin determination was that described by F. M. Strong and L. E. Carpenter, Ind. and Eng. Chem. Anal. Ed. 14, 909 (1942). All varieties were supplied by the Department of Horticulture.

Riboflavin in Vegetables
Micrograms per gram

	Raw	Cooked	Blanched
Little Marvel Peas	8.68	8.22	8.40
Laxton's Progress Peas	8.02	6.23	6.22
Bountiful Green Beans	14.40	13.84	13.78
Green-pod Stringless Green Beans	17.69	18.29	12.29
Webber Wax Beans	14.23	14.10	12.10
Top Notch Golden Wax Beans	17.50	17.00	19.50
Golden Bantam Corn	6.78	6.09	6.57

The method used for niacin determination was that described by W. A. Krehl, F. M. Strong and C. A. Elvehjem, Ind. and Eng. Chem. Anal. Edition 15, 471 (1943). The three varieties were supplied by the Department of Horticulture.

How much niacin in North Dakota grown beans and corn?

The Station nutritionists (M. I. Wegner and Eunice Kelly) have made determinations on two varieties of beans and one variety of

sweet corn produced in 1943. The niacin content **on the dry basis** expressed in micrograms per gram follows:

Niacin in Vegetables
Micrograms per gram

	Raw	Cooked	Blanched
Greenpod stringless beans	95.4	95.5	91.40
Topnotch Golden Wax beans	84.2	66.9	70.95
Golden Bantam Corn	81.0	67.2	72.40

QUESTIONS ABOUT LINSEED OIL

Is is possible to store flaxseed without damage to the linseed oil in the seed?

E. P. Painter and L. L. Nesbitt, Agricultural Chemists, report that uninjured flaxseed suffers very little change in the quality of its oil even after several years of storage of the seed.

Is it possible to estimate the fatty acid composition of linseed oil from the iodine number?

E. P. Painter, Agricultural Chemist, finds a high degree of relationship between some of the fatty acids and iodine number of linseed oils. The study included 148 oil samples with a wide range in iodine number. The correlation coefficients between the iodine number and fatty acid glycerides were: Saturated, -.80; oleic, -.94; linoleic, -.27; and linolenic, +.97. Except for linoleic acid all are highly significant. Linolenic and linoleic acids are the constituents which make linseed oil a good drying oil. It is possible to estimate the linolenic acid content from the iodine number with much greater precision than the linoleic acid content.

What is the average composition of linseed oil from flaxseed?

E. P. Painter and L. L. Nesbitt, Agricultural Chemists, find that the unsaponifiable material from ripe seeds is about 1 percent of the oil extracted, and that the remaining 99 percent is made up primarily of glycerides. On the basis of detailed examination of 148 samples of linseed oil from several varieties grown in North Dakota and at other locations throughout the United States and Canada they find the following percentages of each of the several glycerides:

Composition of Linseed Oil

	Composition of glycerides			
	Saturated %	Oleic %	Linoleic %	Linolenic %
Average	10.8	24.2	17.0	48.0
Maximum	16.5	42.5	26.8	65.2
Minimum	6.8	11.9	6.9	20.5

The iodine number of this group of linseed oils ranged from 127.8 to 202.8 with an average of 175.9.

What progress is being made on determining the chemical composition of the linseed meal, particularly the proteins in linseed meal?

Bruno Vassel and E. P. Painter, Agricultural Chemists, are investigating the protein constituents of linseed meal. The meal was first extracted with water, then with 7 percent saturated ammonium sulfate solution, both at neutrality, then with dilute ethyl alcohol, finally with sodium carbonate solutions at pH 8.5 and 10.1. Each of the extracts contained proteins which were further fractionated at various salt concentrations and pH values. Although the study is far from com-

plete, the present results indicate that linseed meal contains two alcohol soluble proteins, as well as two or three albumins. One of the alcohol soluble proteins possesses the conventional properties of prolamines, while the other has unusual characteristics. Maximum solubility occurs at approximately 58 percent alcohol concentration. The protein is insoluble at 70 percent or higher alcohol concentrations, but has some slight solubility in water or dilute salt solutions at pH values above 6.1. Its isoelectric point is near pH 4.0. The data on flaxseed meal also indicates that appreciable amounts of non-protein nitrogen exists in the meal. The question is now investigated extensively. Since seed meals are purchased on their nitrogen contest bases, the presence of appreciable amounts of non-protein nitrogen is of considerable practical importance.

What is the effect of storage upon the Vitamin C (ascorbic acid) content of North Dakota grown potatoes?

That potatoes decrease in their Vitamin C content under storage has been adequately demonstrated by the Departments of Animal and Human Nutrition[1], Horticulture[2], Agricultural Engineering[3], and Bacteriology[4]. Irish Cobbler potatoes harvested in September 1942 contain 97.87 milligrams of Vitamin C per 100 grams of dry matter when harvested; after 29 days storage in the Station root cellar 92.10 milligrams; after 45 days storage 56.39 milligrams; after 104 days storage the Vitamin C content had declined to 13.61 milligrams per 100 grams of dry matter and after 195 days to 6.44 milligrams.

Another lot of Cobblers stored in a commercial storage under forced ventilation showed 95.75 milligrams per 100 grams of dry matter at harvest; 73.78 milligrams after 34 days of storage; 44.34 milligrams after 62 days of storage; and only 5.2 milligrams after 156 days of storage. This same lot of potatoes contained 75.18 milligrams per 100 grams of dry matter after 34 days storage under commercial gravity flow ventilation, 50.11 milligrams after 62 days storage, and 8.44 milligrams after 156 days storage.

Vitamin C was determined by the method of Bessey and King[5] as adapted for the Evelyn photoelectric colorimeter by Bessey[6] and Morell[7]. Work is being continued on crops harvested in 1943 to be stored over the fall and winter of 1943-44.

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[1]Animal and Human Nutrition: Eunice Kelly, Human Nutritionist; F. W. Christensen, Animal Nutritionist; M. I. Wegner, Assistant in Animal Nutrition.
[2]Horticulture: Ole Grottodden, Assistant in Horticulture.
[3]Agricultural Engineering: Thomas E. Long, Assistant Agricultural Engineer.
[4]Bacteriology: Ina Bergquist, Assistant Bacterialogist.
[5]Bessey, O. A. and King, C. G.: The Distribution of Vitamin C in Plant and Animal Tissues. Jour. Biol. Chem. 103: 687-698. 1933.
[6]Bessey, O. A. A method for the determination of small quantities of ascorbic acid and dehydroascorbic acid in turbid and colored solutions in the presence of other reducing substances. Jour. Biol. Chem. 126: 773-775, 780. 1938.
[7]Morrell, S. A. Rapid Photometric Determination of Ascorbic Acid in Plant Materials. Ind. and Eng. Chem., Anal. Ed. 13: 793-4. 1941.

QUESTIONS ABOUT INSULATION

Is it necessary to pack loose-fill insulations when insulating farm buildings?

W. J. Promersberger, Assistant Agricultural Engineer finds that insulations made from material such as wheat, oat, flax straw, and corn cobs will not settle if slightly packed when they are installed.

Will treating straw with creosote and used crank case oil lower the insulating value?

W. J. Promersberger, Assistant Agricultural Engineer finds that treating straw with creosote and used oil slightly lowers the insulating value. Nevertheless material so treated has an insulating value that is greater than the minimum value recommended for North Dakota conditions.

A BUTTER QUESTION

Is the bacteria-killing power of water-sterilizing chemicals the same in distilled water as in tap water or other waters?

C. Jensen (Dairy Manufactures) has examined the micro-organisms in water samples used in 41 different North Dakota creameries. These waters have been tested for numbers and kinds of bacteria. Trial churnings have also been made in which butter was washed with water containing bacteria likely to cause flavor defects. Results indicate that certain waters clearly require treatment; hence the department has begun to test the bactericidal values of various chemical compounds. Results indicate that considerable differences exist between the germ-killing powers of various chemicals. Notable differences were found in the killing powers of chlorine sterilizers. These compounds, adjusted to the same chlorine strength but different hydrogen ion concentration, showed wide differences with respect to their germicidal powers. The germ-killing powers were much greater in neutral and acid solutions than in alkaline solutions. Since most North Dakota water supplies are quite alkaline in character, it may be feasible to acidify the water in order to obtain efficient use of chlorine germicides in water sterilization.

How hardy are apricots at Fargo?

The Department of Horticulture (H. Mattson) reports serious losses of so-called hardy apricots. Six trees of Scout from the Dominion Experimental Farm at Norden, Manitoba, 12 trees of 4 other Morden selections, and 11 trees of 8 selections made by this Station had been set in the College orchard, 6 in 1939, 5 in 1940, and 18 in 1942. By the spring of 1944 only one tree, a thrifty Scout tree set in 1940 was the sole uninjured survivor.

On the other hand older apricot seedlings in nearby shelterbelt rows, which did not suffer from as much spring flooding underwent only 10 to 20 percent injury. Mattson suggests that the graft union or the root stocks of the grafted selections and varieties may be largely responsible for the heavy losses.