MINNESOTA FEEDSERVICE

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1957 Farm Crop Listing Shows Few Changes

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THE LIST OF recommended varieties of farm crops for Minnesota was revised at a recent Varietal Recommendations Conference at the Minnesota Agricultural Experiment Station. No varieties were added this year—but Sentry durum wheat, Mo. 0-205 oats, and Multiplier field peas were removed.

What Are Recommended Varieties?

Recommended varieties have been proved superior to other varieties in carefully conducted comparative tests. Trial plots are grown at the Central Station, at the branch experiment stations, in individual farmer's fields, and in cooperation with county organizations in southwestern and in extreme north central Minnesota.

In addition, the varieties are tested for disease resistance in the greenhouse and in special disease nurseries at St. Paul. Varieties of wheat, barley, flax, and soybeans are tested also in the laboratory for acceptability for industrial uses.

Except in unusual circumstances, a variety must have been tested in Minnesota for a minimum of 3 years before it is considered for recommendation. New varieties that were developed in other states or in Canada may be brought into the state for seed production and for use on farms before the 3 years of tests can be completed. Such varieties are listed as "not adequately tested."

The list of recommended varieties is determined at a conference which this year included Chairman T. H. Fenske, associate dean of the Institute of Agriculture; staff members of the departments of Agronomy and Plant Genetics, Plant Pathology and Botany, and Agricultural Biochemistry; the superintendents and agronomists of the branch experiment stations at Waseca, Morris, Crookston, Grand Rapids, Duluth, and Rosemount; and representatives of the Minnesota Crop Improvement Association.

A discussion of the recommended varieties for all crops except corn follows:

Wheat

Varieties on the recommended list for 1957 are Lee and Selkirk, hard red spring; Langdon and Ramsey, durum; and Minter and Minturki, hard red winter. Sentry was removed because it is susceptible to 15B stem rust, a race that has caused serious loss to the durum crop in recent years.

Oats

Recommended varieties are: Andrew and Minland, early; Ajax, medium early; and Branch, improved Garry, Rodney, and Sauk, late maturing. Mo. 0-205 was dropped because it is discounted on the market for its dark color and because it has not been outstanding in yield.

Barley

Recommended varieties are: Kindred (L) and Montcalm, for malting; Peatland and Vantage for feed; and Fox and Traill. The malting quality of the last two varieties has not been established.

Rye

Adams and Caribou are recommended. Both are fall-sown varieties.

Flax

Recommended varieties are: Marine, early; B5128 and Redwood, late. Raja was placed in the "not recommended" group because of relatively poor yield.

Soybeans

Recommended varieties are Acme and Flambeau, very early; Capital, Grant, Norchief and Ottawa Mandarin, early; Chippewa and Renville, medium-early; Blackhawk, medium; and Harosoy, medium-late.

Sunflowers

Advance is a hybrid variety, medium in maturity, suitable for both feed and oil. Arrowhead is early in maturity and suitable only for feed. Both are recommended.

Field Peas

The recommended varieties are Chancellor and Dashaway; both being medium in maturity. Multiplier was dropped from the list because of its lateness and comparatively low yield.

Alfalfa

The recommended varieties are Ladak, Ranger, and Vernal for the longer rotations and Narragansett for rotations that include alfalfa for two crop years or less.

Clovers

Medium Red Clover: Midland and Wegener are the recommended varieties.

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Folder Gives Complete Story on Crop Varieties

Minnesota Agricultural Extension Folder 22, "1957 Varieties of Farm Crops," gives a complete summary of all crops which are recommended, not adequately tested, or not recommended. For copies, see your local County Extension Office; or write to the Bulletin Room, University of Minnesota, Institute of Agriculture, St. Paul 1, Minnesota.

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Trends in Fertilizer Use

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Statistics on the volume of fertilizer used in Minnesota, as well as on the grades in most prevalent use, show that farmers are changing in their fertilizer usage.

In 1926, for instance, only 5,000 tons of fertilizer was sold. By 1940, however, the amount was 18,627 tons and by 1950, 213143 tons. Last year it was 371,000 tons.

Changes have also occurred in the grades of fertilizers used. In 1946, 2-12-6 was he principal grade sold. But it went out of the picture completely when the fertilizer law was passed in 1949. This law requires that fertilizers sold in the state must contain 27 percent total plant food nutrients. The 2-12-6 grade was replaced therefore by 4-24-12, which reached its peak of use in 1952 and is now being replaced by 6-24-12.

Savings in Higher Analysis

These replacements mean savings in both dollars and labor for the Minnesota farmers. The replacement of 2-12-6 in 1946 with 4-24-12 represented a saving of a million dollars in freight by 1950—and the farmer handled 86,000 tons less fertilizer. Likewise, replacement of the 3-12-12 grade of 1949 with the 5-20-20 grade in 1954 has represented a saving of $770,000 and means that some 95,000 tons less fertilizer was handled by the farmer.

More Nitrogen Used

The availability of nitrogen since World War II has brought about a revolution in nitrogen use. The most spectacular increase has been with 82 percent nitrogen, anhydrous ammonia. In Minnesota last year, 40 percent of the straight nitrogen used was anhydrous ammonia.

The increase in nitrogen use is also reflected in the grades of fertilizer used. Ten years ago, the N-P_2O_5-K_2O ratio was 1-11-4; in 1950 it was 1-8-3, and in 1955 it was 1-2-1. Use of nitrogen has increased 60 percent in the last five years.

Liquid Fertilizers

One of the most recent innovations in fertilizer use is the complete liquid solution. The first tank car of this material was brought into Minnesota three years ago. Special application equipment has been devised for these liquid fertilizers. Fifty-gallon tanks on the backs of tractors can supply the complete liquids for spraying on the soil surface through a weed-sprayer boom. Or the liquids can be applied with a special planter attachment at seeding time.

Theoretically, these liquid fertilizers, as soluble materials, are immediately available to the plant. Although complete solubility is not always an advantage, these liquid materials should have a very definite place as "starter" fertilizer on many Minnesota crops.

Increase in Fall Fertilization

Because of lighter work schedules, accessibility of the fields to applicator equipment, and often a money discount on fertilizer purchased then, there has been a rapid increase in application of fertilizer in the fall.

Experiments have shown that the correct time to apply phosphate and potash to soil *testing low* in these plant food nutrients is whenever the farm operator finds the time and the necessary equipment to do the work.

Generally speaking, it makes little difference what time of the year such fertilizers are applied. However, these broadcast applications do not eliminate the need for starter fertilizer at planting time.

For nitrogen, the time of application is more critical. In general, nitrogen fertilizers should not be applied to sandy soils in the fall. Fall applications of all forms of nitrogen are permissible on heavy textured soils in areas with an annual rainfall of less than 25 inches.

Nitrogen fertilizers should not be applied in the fall—even on heavier textured soils—in areas where the annual rainfall exceeds 25 inches and where leaching of nutrients from the soil may occur.

Farmers Change Fertility Programs

Many farmers have found it necessary to change their fertility programs. They have found that the use of one grade or analysis on their farm is a thing of the past. Each field on the farm may need a different kind of fertilizer. The rates which must be used also vary from farm to farm and from field to field.

Because of economic considerations, fertilizing only the legume in the rotation would be a mistake on most farms today. Farm operators are finding it more profitable to fertilize crops according to the needs of the individual crops. Special consideration in fertilization should be given to the crop which gives the farmer the highest net income per acre.

Soil Testing Is Important

Increased use of soil-testing facilities has resulted in wiser use of fertilizer on many Minnesota farms. The proper use of fertilizer, applied according to soil test, represents a way of fully utilizing land available for production. Research has led to recommendations for increased fertilizer use. Proper use of fertilizers complements gains from other improved practices such as use of recommended varieties, rotations, and peat and weed control.

There is still a big gap between present use of fertilizer and the amounts which would be profitable. The U. S. Department of Agriculture has estimated that average yields of seven crops in Minnesota—corn, oats, wheat, barley, flax, potatoes, and hay—could be increased from 30 to 184 percent with proper fertilizer use.

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1957 VARIETY LIST

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Biennial Sweetclover: Madrid is a yellow-flowered variety of medium maturity, while Evergreen is a white-blossomed variety very late in maturity. No others are recommended.

Other Crops

Bromegrass: The recommended varieties are Achenbach, Fischer, and Lincoln.

Birdsfoot Trefoil: At the present time, Empire is the only variety recommended for Minnesota.

Sudangrass: Piper is the only variety recommended.

Timothy: The recommended varieties are Itasca and Lorain.

Kentucky Bluegrass: Park is the only variety recommended.

Improved Diets for Poults

PAUL E. WAIBEL*

Various kinds of rations may be formulated for starting turkey poults. These may be separated into three general types: 1) a low-energy ration containing varying amounts of wheat bran, wheat standard middlings, and ground oats; 2) a high-energy ration based primarily upon corn, soybean oil meal, and small amounts of sources of unknown growth factors; and 3) a most recent type of formulation, similar to No. 2 but containing 2½ or 5 percent of a stabilized fat or oil.

It is evident turkey poults will eat various amounts of these rations, depending on the energy content. Thus to produce one pound of gain, considerably less of the high-energy ration containing fat would be required than of the older-type ration containing bran and midds. Since the poult's daily requirement for protein, vitamins, and minerals is more or less absolute, it is obvious that more efficient rations must be fortified with higher levels of those critical ingredients.

Actually we have little evidence to show how much enrichment of those critical nutrients must be practiced. All of the requirements as stated in the National Research Council publication, "Nutrient Requirements for Poultry," are in terms of percentage or units per pound of ration. For this reason, the use of Calorie-protein rations became important. Other things being equal, it is probably just as important to relate the content of nutrients other than protein with the energy content of rations.

Table 1. Variable composition of poult diets used in studying Energy-Protein relationships

Protein	Tallow	Corn	SBM-50*	P.E.†	C/P‡
28%	none	43%	36.6%	809	28.9
28	10%	31	38.6	960	34.3
28	15	25	39.6	1,036	37.0
32	none	33.8	45.8	760	23.8
32	10	21.8	47.8	910	28.4
32	15	15.8	48.8	985	30.8

* Soybean meal, 50% protein.

† "Productive Energy" (G. S. Fraps, 1946), expressed in large calories (equivalent to 1,000 ordinary calories). ‡ Calorie-protein ratio.

The scope of this discussion will involve factors that must be considered in diet formulation. The results of some experiments studying the need for unidentified growth factor supplementation will be reported. Other considerations will involve the addition of stabilized fat to the turkey starting ration, and the effect of the addition upon the poult's requirement for a most important nutrient class—protein.

Other experiments were designed to study the need for additional amino acids, such as methionine and lysine, when high-energy rations are formulated for turkey poults.

All poults used in the experiments were either Broad Breasted Bronze or Broad Breasted White. They were maintained in batteries for an experimental period of either 4 or 6 weeks.

Unknown Growth Factors Studied

The basal ration employed in studies of the unknown growth factor requirement of poults was composed of corn and soybean oil meal, well-fortified with known vitamins and minerals. A mixture of unidentified factors supplements containing 6 percent fish meal, 3 percent alfalfa meal, 3 percent distillers dried solubles, and 2 percent dried whey was used to supplement the corn-soybean meal ration. Further, the dietary usefulness of grass juice and chlortetracycline was tested, both alone and in combination, when supplemental to the corn-soybean meal ration with the unknown factor supplement already named.

Results indicated that the mixture of unknown factor supplements produced consistent, although small, growth responses when added to the ration containing principally corn and soybean meal. The addition of grass juice to such rations which contained the unknown factor sources produced growth responses in certain of the experiments only. Chlortetracycline (50 p.p.m.) was very consistent in its growth-promoting effect, either in the presence or absence of a dietary source of grass juice.

Other experiments at the University by Dr. Elton Johnson, studying the usefulness of fish solubles in poult starting rations, have not indicated consistent growth responses to the factor(s) in the fish solubles during the past season. The basal ration in his studies contained alfalfa meal, in contrast to the basal ration in the other studies reported here.

Protein and Energy Studies

In studies dealing with protein and energy relationships, a level of 10 percent of stabilized, bleachable fancy tallow was employed to increase energy content of the ration. This level of fat was added to 28 or 32 percent protein rations containing 6 percent fish meal, 3 percent alfalfa meal, 3 percent distillers dried solubles, and 2 percent dried whey (table 1).

In most cases the addition of 10 percent tallow to the 28 percent protein ration did not result in any change in growth rate, although feed efficiency was improved. When the 32 percent protein ration with no added fat was employed, there was also no consistent increase in growth over the control group.

However, when 10 percent of dietary tallow was added to the 32 percent protein ration, marked growth responses were obtained. These responses were accompanied by an improvement in feed efficiency (table 2).

Table 2. Typical experiment showing influence of dietary Protein level, Tallow, and Amino acids on poult performance*

Rations (50% Soybean meal)	Weight at 4 weeks (grams)	Response	F.E.
28% protein	582	.....	1.51
28% protein plus 10% tallow	553	—5.0%	1.40
32% protein	595	2.2	1.42
32% protein plus 10% tallow	651	11.9	1.34
32% protein plus 15% tallow	650	11.7	1.22
32% protein and 15% tallow plus amino acids and added minerals	779	33.8	1.20

* 14 Broad Breasted White poults to a group. All diets contained 0.05% methionine except the last one listed.

In most of these experiments, stabilized bleachable fancy tallow has been used as the potent energy source. Other experiments by Dr. Johnson show that soybean oil may be satisfactorily used to produce essentially the same effect.

Amino Acid Supplementation

Certain experiments were designed to study the usefulness of dietary methionine and lysine in rations of extremely high energy content. These diets were formulated to contain 15 percent of tallow, and have a protein content of either 32 or 28 percent. At the higher protein level, added methionine produced very marked growth responses. While it was not possible to establish a methionine requirement under these conditions, increased growth responses were obtained when the added methionine was greater than 0.4 percent of the ration.

The amino acid lysine did not appear to be limiting at 32 percent protein, probably because of the high level of soybean oil meal in the ration. But at the 28 percent protein level (with 15 percent tallow), both methionine and lysine appeared to be limiting amino acids.

Summary and Conclusions

The results of these studies showed quite clearly that, under the experi-

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Unknown Growth Factors

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There are about four unidentified growth factors required for the maximum growth of chicks and poults. Researchers have discovered these by adding unknown growth factor sources to diets composed of 1) practical feed ingredients, 2) a semi-practical type of diet containing some practical feed ingredients and some synthetic materials, and 3) a semi-purified or synthetic-type diet.

The growth responses obtained are directly related to the *carry-over* of the unknown factor from the hen through the egg to the chick or poult.

Stress Factors

In Texas, more consistent growth responses have been obtained with chicks maintained on litter, with the addition of unknown growth factor sources to the broiler diet, than with similar chicks maintained in batteries and under conditions where a lower level of stress factors persist. Growth responses have consistently been produced ranging from 15 to 35 percent through the addition of sources of the "fish factor," the "whey factor," or a combination of the two to the diet.

Samples of ingredients taken from the same shipping lot of the unknown growth factor sources have failed to produce growth responses greater than 5 percent when the chicks were maintained in batteries with raised screen floors, under a cleaner environment.

It is believed that maintaining birds with a higher subclinical disease level increases the requirement for the unknown growth factors. This, in turn, explains why a greater growth response has consistently been obtained through the addition of unknown growth factor sources to an all-vegetable protein type diet of chicks maintained under field conditions.

Some of the additional stress factors which might be listed are climate, overcrowding, fright, and hyper-activity. The greatest stress factor existing at the present time, however, is that the feed manufacturer and the poultry producer are continually expecting the bird to grow at a more rapid rate and to finish with less feed.

Practical Unknown Growth Factors

The two practical unknown growth factors required at the present time are the "whey factors" and the "fish factor." Feed manufacturers are adding sources of these to broiler, starter, and growing feeds for chickens and turkeys. (Dried whey, distillers dried solubles, dried brewers yeast, and butyl fermentation solubles are seurcose of the "whey factor"; condensed fish solubles, fish meal, and dried brewers yeast are "fish factor" sources.) Condensed fish solubles has been the most consistent source of the "fish factor" at Texas A. and M.

The unknown growth factor content of each of the sources listed may vary to an appreciable degree. For that reason it is wise to use more than one source of each of the unknown factors. It is not necessary to add more than 2½ to 3 percent of such a source to obtain an adequate amount of the factor for maximum growth and feed efficiency.

Economics of Unknown Growth Factors

A number of experiments have been summarized by various workers on the economics of unknown growth factor sources. The effects of stress become very apparent when the data are carefully evaluated. In each instance, however, the addition of 2½ to 3 percent of such a source has increased profit per thousand birds at least $10; under conditions of maximum stress, profit per thousand birds has ranged as high as $117.

From such data, it is quite apparent that adding 2½ to 3 percent of unidentified growth factors supplying the "whey" and the "fish" factors will increase the profit per thousand birds for the poultry producer. Feed for broilers, starting chicks, and turkeys should not be formulated without an adequate supply of the "whey factor" and the "fish factor" present.

Breeder Stock

Data from experiments with chicken hens demonstrating the effect of adding unknown growth factor sources to the laying and breeding diet are much less conclusive.

Some workers believe that it is not necessary to add such sources to laying and breeder diets. But experiments conducted at Texas A. and M. College show the "whey factor" to be necessary for egg production and the "fish factor" to be necessary for maximum hatchability. The latter is particularly true for turkey breeders.

* Texas A. and M. College. This article is condensed from a paper which Dr. Couch presented at the 1956 Animal Nutrition Short Course.

DIETS FOR POULTS

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mental conditions employed, the use of added fat plus increased protein levels resulted in faster growth rates and improved feed efficiency. It is recognized that the 10 percent tallow level employed in higher than presently feasible under most commercial conditions. However, it is quite possible that 2½ or 5 percent fat additions might be useful under practical conditions.

To what extent such additions of fat will improve performance under field conditions can be best determined by appropriate field trials. Some recent evidence suggests that pelleting of a conventional ration will produce a growth response similar to that obtained by adding low levels of dietary fat. Generally, the experience in our laboratory where mashes were used has indicated that a 10 percent fat level will produce a greater growth increment than a 5 percent level. Perhaps the best effect would be shown by a well-balanced pelleted or crumbilized feed containing 2½ or 5 percent of fat.

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