Nitrogenous Compounds from Steffen Waste Water

The evaporated nitrogen concentrate from the Longmont pilot plant is being worked up for the recovery of betaine, glutamic acid and other nitrogenous compounds.

We have noted before that the glutamic acid content of this year's beets was very low. The Longmont Steffen waste contained only about 45 pounds per ton of dry substance. This is about one-half of the amount for the previous year. The nitrogen concentrate produced in the pilot plant contains 100 pounds glutamic acid, 800 pounds betaine and about 300 pounds of other nitrogenous compounds per ton of dry substance. For the first time a sufficient quantity of the nitrogen compounds other than glutamic acid and betaine are available for study. This group consists of amino acids, the identity of some of which are known and some unknown. The preliminary study has yielded a quantity of tyrosine, the presence of which was suspected but heretofore never definitely identified or separated. Compounds of tyrosine are used as antioxidants in edible fats.

Quality of Sugar

The annual survey of sugar quality for 1942-43 sugar is being made on composite samples from each factory. The poor quality of beets and difficult operating conditions, due to inexperienced labor, would lead one to expect a lower quality product. However, the reduction in quality is surprisingly small. The color, turbidity and specific conductance are slightly higher, the candy grade and foam test are unchanged, and there is a definite improvement in SO₂.

Plastics from Beet Pulp

It has been found that a plastic material of some merit can be made from beet pulp. The process, in brief, consists in cooking dried pulp with water, aniline or other reagent in an autoclave at about 150 lbs. pressure, drying the hydrolyzed material at a low temperature, mixing it with wood flour with or without the addition of plasticizers, and moulding the mixture at high pressure at about 190° C. The result is a hard, black, shiny product of relatively high tensile strength, suitable for making knobs, handles, instrument panels, etc. Further exploratory work is being done to determine the variations in properties and moulding characteristics resulting from the use of different plasticizers and different methods of treatment.
CURRENT AGRONOMIC AND PLANT GENETIC RESEARCH
IN CENTRAL AND EASTERN UNITED STATES

H. F. Brewbaker

On a recent visit to the State Agricultural Experiment Stations at Minnesota, Wisconsin, Michigan, New York, Illinois, and Missouri; the Universities of Chicago and Columbia; and the United States Department of Agriculture at Beltsville, Maryland, I had the opportunity to visit with many research men and to discuss problems of mutual interest with them.

It occurred to me that some of the observations made in this connection might be of interest to the readers of The Research Bulletin.

I took about one month for the trip, stopping from one to five days at a research center. While I had personal acquaintances, including former associates, at each of these stations, I made many new contacts which were interesting.

Extensive research in these institutions

These Central and Eastern Stations have become great centers of Agronomic and Plant Genetic research in recent years.

Thirteen years ago only a handful of research men were on the faculty of the Plant Genetics Division at Minnesota; now there are upwards of twenty-five full time employees in this Division which is housed in a four-story modern office-laboratory, and class room building.

The United States Department of Agriculture has rather recently moved from the Capitol grounds out about twelve miles to Beltsville, Maryland, where it is housed in new and very extensive quarters, with ample space and acres of green-houses, on a tract of 7000 acres, which also provides space for experimental fields, pastures, etc. This now constitutes the greatest Experiment Station in the world. Much construction is still going on and the staff and employees find it necessary to carry their own lunches for the most part, due to the absence of restaurants. The opportunities for research appear almost unlimited.

The loss of staff members is becoming a serious handicap to research in many institutions, others appear to be in better shape. It seems that Minnesota and Wisconsin claimed deferment for research men and were granted such, while Illinois and Missouri did not claim such deferment and their young men are being drafted for military service.

Agronomic Practices

I learned of certain developments which may be found useful in the West.

At Wisconsin, the Agronomy Department have promoted a Western roller-seeder combination for small seeds such as grasses and legumes. A seed hopper is mounted on the roller and the seed is distributed in the furrows made by the first roller and covered by the second roller. A 30% saving in seed is claimed for this since the seed is placed better for germination.
Dr. Wiggins at Cornell finds, with a planting rate of 15" of corn and 15 to 20" of late soy beans ("Illini" or "Chief") drilled in the same row (2 hoppers necessary on the planter), about 10% increase in total dry matter and 50% increase in total protein when the crop is siloed. This is a rapidly growing practice in New York, and should be well adapted to irrigated farming where ample water is available.

Breeding Methods

When it is realized that efficient breeding methods depend upon the proper genetic mode of attack, and that the Science of Genetics dates to 1900 when Mendel's Laws of Heredity were rediscovered, it is not surprising that these methods will continue to develop rather rapidly as the Science of Genetics progresses. The new developments are not often published until they have been thoroughly tested.

One new approach suggested by Dr. L. J. Stadler at Missouri is now being applied extensively to corn breeding, and it is admirably adapted to sugar beet breeding, but will not be published until the experiments now in progress on corn are completed. The principle is very simple, being one of harvesting both selfed (bagged) and open-pollinated seed from the same plants after which the open-pollinated seed is used in plot tests to determine the breeding value of the mothers; the selfed seed is then planted from the best producing mothers since it is not subject to contamination with poorer producers. The method will be tested out in our sugar beet breeding work.

Seedling diseases and root rots

Surprisingly enough, fume phosphate was not known to many of the Eastern men. There was much interest expressed in the possibility of stimulation of seedling vigor through its use as a seed treatment, possibly even by a spray-glue method for attaching sizeable quantities to the seed, thereby reducing the possibility of seedling disease losses. Dr. J. G. Dickson at Wisconsin expects to try it out widely this spring on several crops.

Clean cultivation was considered essential in avoiding certain root rot diseases, particularly Rhizoctonia. It was held by those at Wisconsin that this disease could probably be controlled by part-season summer fallow.

Fusarium conglutinans has been easily controlled in cabbage by breeding. Whether this will prove to be the case in sugar beets remains to be seen. The symptoms in cabbage are somewhat similar to those in beets although the organism is not supposed to be transferable.

Growth-promoting hormones

There has been considerable popular interest stirred up as a result of studies made at Oklahoma by Dr. J. C. Ireland. His results purport to show tremendous increases in production from simple seed treatments for several crops including sugar beets with any one of a number of these products which are on the open market. Dr. S. T. Dexter at Michigan has completed a wide series of well planned and carefully controlled tests with several crops in which he failed to show a single case of positive increase in production. Similar conclusions were reached by Grace in Canada, and we found the same lack of response to hold in a well-replicated but preliminary test with sugar beets at Longmont. The general opinion, so far as I could learn, is complete skepticism with respect to the
results at Oklahoma, first, because nobody appears able to duplicate them, and second, because the field plot technique used was impossible. It just doesn't seem reasonable to suppose that by any simple seed treatment an irresistible urge would be imparted to an unsuspecting plant to disregard both its genetic capacity to produce or the fertility of the land on which it is to grow.

Some very interesting physiological responses have been observed as a result of treatment of growing plants or stored plant parts. I saw a small greenhouse of tomatoes at Michigan which had been gassed with one of these substances, and all of the tomatoes, which were to all appearances growing luxuriantly, were expected to be seedless, otherwise normal, perhaps even sweeter than normal. Another of these substances when applied in a wax coating or as a gas to rose cuttings, in excess, induced a 40- to 60-day complete dormancy. This proved very useful in that not only were molds much less on the dormant tissue but the cuttings which were held dormant made a much more rapid growth when set out in the spring. The possibility occurs at once that if such an effect could be induced in stored sugar beets, pile losses from respiration, and possibly rots, could be reduced materially.

Sugar beet research

Considerable work on this crop is being carried on at Minnesota, Wisconsin, and Michigan, more or less in cooperation with or under the direction of the Office of Sugar Plants at Washington. The work at Washington is to be handicapped somewhat by the transfer of the geneticist, Dr. F. A. Abegg, to Old Mexico to work on rubber plants. This leaves three pathologists, Drs. Coons and Kotila and Mr. Stewart, in the Washington office. Reductions in operating funds are expected and it is not anticipated that Dr. Abegg will be replaced. It therefore becomes obvious that Government Research on the sugar beet crop East of the Rockies, at least, will be less able to meet the demands for increased research, and that either the State Experiment Stations or the sugar companies will find it necessary to carry proportionately more research.

Specifically, fundamental cyto-genetic work on sugar beets, which is sorely needed by the plant breeders as a background for efficient breeding work, is not likely to be forthcoming under present conditions.
FERTILIZER TESTS, ETC.
A. C. Maxson

Fifteen strip tests were conducted in which no fertilizer or manure treatment was compared with from 100 to 200 pounds of ammonium sulphate per acre. The results are given by factories means below.

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<td>15.637*</td>
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Avg. All Trials 11.099 15.2 3381 13.654 15.9 4357

* 100/" per acre Ammonium Sulphate
** 200/" per acre Ammonium Sulphate

Of the 15 tests reported in only one case did the nitrogen fail to increase the yield of roots and sugar per acre. In 7 cases the per cent sugar was lower where the nitrogen was applied.

At Billings 6 comparisons between 100/" and 200/" ammonium sulphate were made. The increase due to the first 100/" of nitrogen fertilizer was 1,275 tons of beets per acre. The 200/" application increased the yield of beets 2,941 tons per acre over no nitrogen and the second 100/" of ammonium sulphate increased the yield of beets 1,666 tons per acre over the 100/" application. The second 100/" was just as profitable as the first on the average.

Nine strip tests were harvested in which manure alone and manure plus ammonium sulphate were compared. The factory district means are given in the following table.

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<td>-</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>10.663 (200&quot;)</td>
<td>-</td>
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</tr>
</tbody>
</table>

Ave. All Trials 12.318* 15.5* 3798* 12.924* 15.4* 3994*

* Does not include Billings
The increase due to ammonium sulphate was but .606 of a ton of beets per acre. This is only about half the increase resulting from the use of ammonium sulphate alone. One comparison of \(100\frac{1}{2}\) and \(200\frac{1}{2}\) of ammonium sulphate per acre used with manure was made at Billings. This shows an increase of 0.737 of a ton per acre for the \(100\frac{1}{2}\) application over no nitrogen and 0.331 of a ton for the \(200\frac{1}{2}\) over the \(100\frac{1}{2}\) application. All of these figures indicate that on the soils covered by these trials ammonium sulphate has only about one half or less the value when used with manure that it has when used alone.

Cracked seed and uncracked seed was compared in 98 fields located in all factory districts. The average for all factory districts was 13,256 tons per acre for uncracked seed and 13,618 tons per acre for cracked seed; sugar per cent uncracked seed 15.7 and cracked seed 15.5; sugar per acre 4162 for uncracked seed and 4221 for cracked seed.

SEED

H. V. Dahlberg

The 1942-43 seed acreage is in good condition in Arizona, New Mexico and northern California. There has been some loss of acreage in Oregon and Washington because of unfavorable winter conditions and floods. The fall was very dry and some growers waited too long to irrigate as irrigation is an expensive procedure by the overhead method which is used in the Willamette Valley. During January the valley had severe floods, followed by a heavy snowfall. Acreage has been lost both by being drowned out and by smothering with weeds, which cannot be successfully removed during the winter months because of heavy rainfall and muddy conditions. Each year of experience in the Willamette Valley demonstrates that it is far from being the dependable seed area we have in the Southwest.

The winter at Windsor has been most unfavorable to the seed crop because of severe winds, minimum snow protection with low temperatures and dry weather which made it impossible to maintain a proper moisture condition at the surface of the ground. There will be a considerable loss of stand and some loss of acreage.

Since most of our seed acreage is in the state of Arizona we still expect to harvest a very good seed crop unless something happens there before harvest.

The combination of reduced beet acreage planted in 1943, and the use of sheared seed will make a material reduction in the amount of seed issued this spring. We will therefore have considerably larger seed stocks in our warehouses in June, 1943 than we had in June, 1942. This is perhaps fortunate with the prospects of having difficulty in securing seed acreage to meet all U.S.A. demands for acreage to be planted in August and September of this year. Our company has no worries about seed supplies for the next two years, whereas many of the Eastern companies have rather small seed inventories.
The labor situation in the Southwest is being improved by provision of more mechanical harvesting of seed. It is also planned to shorten the threshing period by the use of more traveling thresherers, which appreciably reduce threshing costs. In Arizona we are subject to some showers during the month of July and there are many advantages in getting the seed threshed and under cover as rapidly as possible.

Up to the present time we have had no difficulty in securing sufficient commercial fertilizers for the seed crop. The very difficult bag situation is being met by the use of some cotton bags, pulp bags, and a large number of used bags returned to the sugar companies by beet growers.

Sheared Seed

The shearing plants at Longmont and Scottsbluff have about finished operations, and those at Sterling and Billings will be through shearing in a week or so. While there have been some variations in the percent recovery of sheared seed, on the average the variations have been less than I expected, and the overall recovery has been good. As anticipated, some seed varieties do not show as high a recovery as do others. The recovery for all four plants will probably fall between 60 and 65%, which is a very good figure.