We're Learning About Hemp!

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HEN IT BECAME apparent that our regular supply of manila fiber (abaca) would no longer be available for making rope and other cordage, the Government turned to American grown hemp (Cannabis sativa). Iowa farmers, along with those of some other states, were asked to produce fiber, an essential war material.

This job which Uncle Sam handed to the Iowa farmer was a new one — few on Iowa farms had had any previous experience with the crop. In Wisconsin and Kentucky, where a small acreage had been grown yearly since World War I, farmers had learned that hemp requires uniformly fertile soil and that for high yields of good quality fiber, a thick stand of tall but slender stalks was essential. Good rotations and a liberal use of manure had helped them to produce successful crops.

Just how this new crop would respond to our prairie soils in north-central Iowa, with our somewhat different farming practices as well as different climatic conditions, no one knew. It was apparent that we needed much more information on the choice of fields, seeding practices and the use of fertilizers.

The Iowa Agricultural Experiment Station, accordingly, has conducted field and laboratory experiments during the past year to help solve some of the problems facing the Iowa farmers as well as the managers of the 11 mills constructed in the state to handle the 44,000 acres of hemp grown.

Early Planting Desirable

For best results in Iowa, we believe that hemp should be planted between April 25 and May 15. In a field experiment conducted at Ames in 1943...

Top: Here is shown one of the hemp harvesters operating in northern Iowa.

Middle: The stalks are spread on the ground in an even swath for retting.

Bottom: This excellent crop of hemp near Traer yielded 4 tons per acre.
Learning About

Hemp!

Hemp sown April 20 to May 5 produced a better stand, grew taller, and produced a considerably higher yield than when sown after May 20. Plantings made on May 5 were slightly superior to those made on April 20.

Drill Seed if Possible

Uniformity of stand is essential for the best production of good quality fiber. A comparison of drilling and broadcasting of seed at Ames showed an average of 9 plants per square foot at harvest in 20 broadcast plots and 18 plants per square foot on 20 drilled plots. The yield of hemp on the drilled plots averaged about 10 percent higher than on the broadcast plots. Not many farmers in the Iowa hemp area own drills, but we believe it's highly important to make as full use as possible of the drills available.

Seeding Rate Studied

Hemp seed is planted at the rate of 5 pecks per acre in Wisconsin while but 3 to 4 pecks are used in Kentucky. Experiments at Ames and Kanawha (Hancock County) in 1942 indicated no significant increases in the yield of stalks by increasing the seeding rate from 3 up to 5 pecks per acre. The percentage of fiber, however, increased slightly with the higher seeding rates, and the total yield of fiber, therefore, was somewhat higher when 5 pecks of seed were planted.

In 1943, rate of seeding experiments (using from 3 to 6 pecks per acre) conducted at four locations showed that the total stand of plants was increased directly by increasing the seeding rate, as also was the stand of small and dead plants. The desirable plants, capable of making line (long) fiber, however, were affected much less by seeding rate. For example, at Kanawha increasing the seeding rate from 3 to 6 pecks per acre changed the stand of desirable plants at harvest time only from 10 to 14 plants per square foot, and at Crystal Lake (on peat soils in the same county) increasing the seeding rate from 5 to 11 pecks per acre changed the stand of desirable plants only from 7 to 10 plants per square foot.

With only slight increases in effective stands, yields were changed but little by increasing the seeding rate. At Kanawha the 5-pek rate gave a slightly higher yield than the other rates used. In all other experiments rate of seeding produced no significant differences in yield. We believe that if seed supplies are short, 4 pecks or less might be used, but when sufficient seed is available 5 pecks probably is desirable because of the slightly thicker stand, smaller diameter stalks and higher percentage of fiber obtained from that rate.

Nitrogen Most Important

A lack of sufficient available nitrogen in the soil was the principal cause of the sickly yellowish-green color and the poor growth of much of the 1943 Iowa hemp crop. Eight fertilizer experiments on important soils in Story County and in five of the hemp-producing counties showed that nitrogen gave the most benefit, followed in order by phosphate and potash.

The acre increases in yield of retted straw ranged from 0.4 to 0.8 tons for nitrogen (125 pounds of ammonium sulfate), from 0.1 to 0.6 tons for phos-
Above: Hemp responds to commercial fertilizers on many Iowa soils. Hemp shown in the foreground received no fertilizer while that in the rear received 500 pounds of 20-10-5 fertilizer to the acre.

Left: The yield of hemp is influenced greatly by the previous crop. The bundles from left to right show the comparative growth following sorghum, corn and soybeans. Best yields followed alfalfa and clover.

phosphate (250 pounds of superphosphate), and a loss of 0.3 to a gain of 0.3 tons for potash (42 pounds of muriate of potash). Where nitrogen was added at the rate of 500 pounds of ammonium sulfate, the acre increases in yield ranged from 1.1 to 2.7 tons of retted straw.

These results show the value of added nitrogen in producing a high-yielding crop of hemp. The amount of nitrogen added in 125 pounds of ammonium sulfate was not enough to give the maximum yield of hemp in any of the cases tested. Where 500 pounds of ammonium sulfate were used along with phosphate and potash, the total yield was satisfactory in all cases (3.4 to 5.9 tons), and the quality of the hemp was raised from No. 3 or No. 4 to No. 1 or No. 2 (except for one field where the hemp graded No. 1 without any fertilization). In one experiment, $20 spent for fertilizer raised the acre value of the crop from $51 to $228.

Phosphate Also Needed

All the experiments showed that phosphate was of some value, although the effect on the growth of hemp was less striking than that of nitrogen. The main reason why a larger increase was not obtained with superphosphate is probably that the growth of hemp was limited by the lack of nitrogen. In other words, when there wasn't enough nitrogen, the hemp could not grow much better no matter how much phosphate was added.

Potash was in general of little or no benefit so far as yields were concerned. This is mainly because there is a good supply of available potash in the soils of the hemp-growing area. There is an indication, however, that on the higher yielding fields, the inclusion of potash in the fertilizer mixture with nitrogen and phosphorus benefited the yield of hemp. There is also a possibility that the potash had a favorable effect on fiber quality which was not measured by the yield of straw. This question cannot yet be definitely answered because our experiments on fiber quality have not been completed. We believe, however, that only where the potash supply in the soil is low enough to decrease the yield would there be a marked effect on fiber quality.

Fertilizing the 1944 Crop

In view of the marked response of hemp to the application of heavy amounts of nitrogen, a fertilizer high in nitrogen should be used where fertilizer is applied. In 1943, most hemp fields were deficient in nitrogen where the previous crop had been soybeans, corn, oats, or sorghum. It would therefore be safest in 1944 to fertilize such fields for hemp unless it is certain that the availability of nitrogen in the soil is high. The 10-6-4 fertilizer probably will come as near meeting the requirements as any now on the market. Based on this year's results, 500 pounds to the acre should give good returns. In many cases this amount probably will not be enough to give maximum yields.

The use of manure should not be overlooked. Manure applications may give good results, but this year we observed that the amount added in the ordinary application was not enough to produce good hemp on an otherwise poor field. Moreover, the growth was in many cases very irregular because of poor distribution. Therefore, when manure is applied for hemp, the field should be covered heavily and uniformly.

Where manure additions or leguminous crops have raised the soil supply of available nitrogen to a high level, fertilizer nitrogen is not needed. In such cases the use of about 200 pounds of 0-20-0 or 4-16-4 probably would give the best results.

Effect of Previous Crop

Our study of a large number of hemp fields in Iowa in 1943 indicates that the preceding crop is very important in determining the yield of hemp. The rating for the various crops shown in the accompanying table is based on yields of hemp obtained in fields which had grown two or more different crops in 1942. The yield of hemp following each crop is calculated as a percentage of the yield after clover and alfalfa.
These two crops were considered together because they were of about equal value in producing a good crop of hemp. Corn and oats also were considered together because their average effect on hemp was about the same.

A rating of various crops grown in 1942 with respect to their effect on the yield of hemp in 1943:

<table>
<thead>
<tr>
<th>Crop in 1942</th>
<th>Relative yield of hemp, taking the yield following clover and alfalfa as 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa-Clover*</td>
<td>100</td>
</tr>
<tr>
<td>Soybeans</td>
<td>75</td>
</tr>
<tr>
<td>Corn-Oats</td>
<td>57</td>
</tr>
<tr>
<td>Sorghum</td>
<td>35</td>
</tr>
</tbody>
</table>

*Second-year red clover or second-year sweet clover. Crops grown on ground which does not need lime.

The order of the different crops in the table is in accordance with their effect on the available nitrogen in the soil. Alfalfa and clover should be placed at the top of the list only when they have been grown on land which does not need lime and when there has been 1 year of pasture or hay (or more in the case of alfalfa) following the year of seeding.

Red clover grown on acid soils without liming or inoculation generally did not fix enough nitrogen to produce maximum growth of hemp. Following clover grown on acid, unlimed soils, the hemp fields probably were about as good as those following soybeans. In areas where the soils are naturally acid, alfalfa is very seldom seeded without inoculation and preliminary liming. Consequently, the hemp fields were uniformly good following alfalfa.

We found that clover which was plowed up in the fall of the season in which it was seeded, or in the following spring, was not of much benefit for hemp. Clover fields which had been allowed to run out to timothy, bluegrass or weeds generally did not produce good hemp.

A further important consideration in regard to the effect of previous crops on the yield of hemp is the number of years the beneficial effect of a leguminous crop will last. The information collected in 1943 shows that the yield of hemp the second year after alfalfa sod was practically as good as it was the first year. No definite information is available on hemp grown the third year after alfalfa, but a few observations indicate that the effect of alfalfa, as measured by hemp growth, drops off rapidly during that year.

Hemp following second-year red clover or sweet clover was practically as good as hemp following alfalfa. However, hemp grown the second year after the clover had been plowed under was considerably poorer — about equivalent to hemp the first year after soybeans. Hemp grown 3 or more years after clover was little if any better than without any clover at all. With soybeans, practically all the beneficial effect on hemp was obtained in the first year.

Harvest, Turn Early

Hemp is cut when the male plants are in full bloom. In Iowa harvesting about Sept. 1 would appear desirable because of the more favorable conditions for retting that are likely to occur in early autumn. Weather data show that temperature and moisture conditions, especially in the western part of our hemp area, usually are much less favorable in October than in September.

TO INSURE GOOD YIELDS OF HEMP

1. Select soils uniformly high in fertility and well-drained but not drouthy.
2. It should follow alfalfa or clover wherever possible. Other fields should be fertilized with 500 pounds of 10-6-4.
3. Early seeding is desirable.
4. Drilling the seed is preferable to broadcasting.

Early harvesting may be facilitated to some extent by early planting.

Hemp fibers are in the inner bark around the central woody portion of the stalk and are loosened by the action of molds and bacteria. “Retting” is partial rotting and should proceed to the point that the fibers may easily be separated but not so far that the fibers themselves are attacked and weakened.

To promote uniform retting in the field, turning the stalks usually is necessary. In both the 1942 and 1943 seasons, late September and most of October were not favorable for retting. Partially retted hemp, however, when turned in the swath by early October, completed retting fairly well in both seasons. Without turning, much of the hemp in Iowa is likely to be poorly retted, resulting in an un-uniform quality of fiber.