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Growing Sunflowers For Silage in Idaho

Sunflowers on the University Farm, Moscow

By

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GROWING SUNFLOWERS FOR SILAGE IN IDAHO

Introduction

The use of sunflowers as a silage crop has attracted considerable attention during the past few years. Resistance to drought and early frost, together with the fact that it yields well, has made the crop popular in many sections of the state. Results of feeding trials published by several experiment stations indicate that sunflowers may, in a measure at least, take the place of corn silage. This is especially true in those sections where, because of unfavorable climatic conditions, corn is not a sure crop.

This bulletin is written to supply information concerning culture and feeding value of sunflowers. It is based largely upon observations and data secured from five years investigations at the Experiment Station at Moscow, and at the Sandpoint Substation. Additional information has been secured from the Felt and Aberdeen Substations, and from successful growers of the crop in various sections of the state. It is hoped that the results of these investigations and observations may be of value to farmers who contemplate growing the crop.

Varieties

The development of sunflower varieties began in Russia. Three leading varieties, of which Mammoth Russian has become of greatest importance, were developed there. This latter variety which has striped gray and white seeds, is the one commonly grown in the United States for silage. The Mammoth Russian type is suited especially for silage production since it has only a central stalk bearing an abundance of leaves and usually but a single head. These characteristics make the variety easily harvested and handled for silage. Other varieties have been developed in this country but none of them has proven as satisfactory for silage purposes as Mammoth Russian.

Adaptation

Like most crops, sunflowers do best on rich loam soils, but they adapt themselves to a wide range of soil and climatic conditions. Their growth in Idaho depends largely upon the amount of water available and upon the length of the growing season. Under dry farming conditions they make limited growth, but their yield is greater than that of most other forage plants. The crop responds readily to irrigation and produces very heavy yields under such conditions.

The largest yields may be expected where there is a long, warm growing season. Growing conditions favorable for corn are ordinarily favor-

able for sunflowers. There are, however, many sections thruout the state where corn is not successful because of climatic limitations. Under such conditions it is possble to produce a greater silage yield of sunflowers than of corn. In these areas, with the exception of extreme elevations where frost occurs every month thruout the growing season, sunflowers can be grown successfully.

Sunflowers are not likely to be of great importance in southwestern Idaho and adjacent areas, where corn produces very satisfactory yields. In northern Idaho, however, except at the lower elevations and in the upper Snake River basin, or in other sections where corn is grown with little success, sunflowers are the logical choice for silage.

Comparative Yields of Corn and Sunflowers

The choice between corn and sunflowers as a silage crop for any locality will depend upon comparative yield and ease of handling. Six years of comparative yields of corn and sunflowers have been secured both at the University Farm at Moscow and at the Sandpoint Substation. These data are shown in Table I. It will be noticed from this table that corn has never outyielded sunflowers in the six seasons the crops have been compared. In 1921 at Moscow, the yield of the two was approximately the same, this season being an especially favorable one for corn production. In the average season at Moscow, however, sunflowers will produce the larger yields. At Sandpoint corn is not a successful crop and sunflowers will produce a satisfactory yield of silage in every ordinary season.

TABLE I.—Showing the comparative yields of both sunflowers and corn at Moscow and Sandpoint.

Season	Yield in Tons Per Acre			
	University Farm		Sandpoint	
	Sunflowers	Corn	Sunflowers	Corn
1920	19.76	8.02	10.1	3.5
1921	9.99	9.30	.....	.....
1922	9.22	6.45	10.7	4.9
1923	16.90	9.76	13.2	4.1
1924	16.72	10.27	10.9	3.8
1925	16.02	8.00	12.5	2.9
Average	14.77	8.60	11.5	3.8

At the High Altitude Substation at Felt, in the Teton Basin, sunflowers have matured sufficiently to produce silage. Corn in that locality very seldom reaches more than the roasting ear stage before killing frost in the fall. Results at the Aberdeen Substation show that corn will mature in the majority of seasons provided adapted, early maturing varieties are

used. The silage yield, however, will not equal that from sunflowers. In 1920 sunflowers grown for silage and thinned to 18 inches to the row, produced 28.5 tons of silage to the acre. The previous year, under similar conditions corn yielded 11.0 tons of silage to the acre.

Cultural Practices

Seed bed preparation

Fall plowing is desirable in preparing the seedbed for sunflowers. Such a practice is of value for the conservation of moisture, for the liberation of plant food and for the control of insects and weeds. Fall plowed soil should be worked as soon as possible in the spring, by discing and harrowing, to put the seedbed into condition for planting. Any weed growth may be killed by additional harrowing before the sunflower is planted. Early cultivation also aids in reducing the moisture in the surface soil, causing it to warm up earlier, which leads to rapid germination of seed.

Seeding

Large areas of sunflowers may be planted with a corn planter or a grain drill with part of the feeds stopped up. Smaller areas may be planted with a garden drill or a hand corn planter. A properly equipped corn planter is the most satisfactory tool because it insures a more even distribution of the seed. The amount of seed required to the acre varies from 3 to 12 pounds depending upon method of seeding. Use of the grain drill requires more seed than any of the other common methods.

Under non-irrigated conditions sunflowers are ordinarily seeded in rows from 36 to 42 inches apart. Under irrigated conditions closer spacing of the rows is often practiced.

The average of the mid-early planting of sunflowers at the University Farm was more satisfactory over a period of five years than either the early or late plantings. Under conditions similar to those at Moscow the best date of seeding is immediately after seeding of spring grain is completed. Satisfactory yields cannot be expected from a late seeding in seasons when hot, dry weather begins earlier than usual.

It would appear from data shown for the years 1922 and 1923 that late plantings might have advantages in certain seasons. However, the high yields shown were due to the fact that the time of harvesting of early seedings was delayed until the late planting was ready to cut. By this time both of the earlier plantings had passed maturity and had lost a large percentage of their moisture, thus reducing their yields.

TABLE II.—Showing the relation of date of seeding of hill planted sunflowers to yield of silage. Idaho Agricultural Experiment Station data, Moscow, 1921-1925 inclusive.

Date seeded	Yield in Tons Per Acre					
	1921	1922	1923	1924	1925	Ave.
Early, 5-1	10.0	7.0	15.8	11.4	8.7	10.6
Mid-early, 5-15	10.6	8.5	15.9	13.9	10.1	11.8
Late, 6-1	10.5	10.3	17.0	12.6	6.9	11.4

The following table shows five years' data on the yields from various spacings of sunflowers grown at the University Farm, Moscow. Spacings ranged from the extremes of 3-4 to 20-24 inches. In all cases rows were 42 inches apart. Thinning to the desired stand was done by hand shortly after germination. The average over the five year period shows that the thicker stands produced the highest yields. The difference between the highest and lowest yields was three tons.

TABLE III.—Showing the effect of different spacings upon the yield of sunflowers for silage. Idaho Agricultural Experiment Station data, Moscow,, 1921-1925 inclusive.

Spacings of Plants in the Row—Inches	Yield in Tons Per Acre					
	1921	1922	1923	1924	1925	Ave.
3 - 4	11.4	10.8	15.2	15.0	8.3	12.1
4 - 8	10.4	10.6	14.5	14.0	6.8	11.3
8 - 12	9.6	9.8	13.4	12.0	5.8	10.1
12 - 16	9.4	8.9	12.9	10.0	5.4	9.3
16 - 20	7.7	8.1	13.1	11.4	6.1	9.3
20 - 24	7.2	8.8	12.8	10.6	6.3	9.1

Data are also presented to compare yields from hill plantings containing from one to four plants. The hills were spaced 42 inches apart each way. Two plants to the hill gave slightly higher yields than either the one plant or three plant test and each of the latter exceeded the yield of plantings made at the rate of four plants to the hill.

TABLE IV.—Showing the relation of the number of sunflower plants to the hill and the yield of silage. Date planted, 5-15, Idaho Agricultural Experiment Station data, Moscow, 1921-1925 inclusive.

Number of Plants to the Hill	Yield in Tons Per Acre					
	1921	1922	1923	1924	1925	Ave.
1	9.7	9.4	18.0	12.1	6.1	11.1
2	10.3	9.5	18.9	11.7	7.4	11.6
3	10.0	9.2	16.9	11.4	8.7	11.2
4	9.2	8.6	15.6	12.1	9.3	10.9

Data in Table V show the yields in relation to various dates of planting and various spacings over a period of four years at Sandpoint Substation. Early plantings were made as soon as soil conditions were favorable in the spring and the others at three week intervals. The dates of early plantings ranged between April 7 and May 19 depending upon climatic and soil conditions of the season. Rows for all plantings were 36 inches apart. Four plants were left in the hills.

Early planting proved to have a considerable advantage over later

seeding in all years tested except 1923. The difference that year can be accounted for by the unusually long frost-free period during which the early planting reached maturity while the others continued in growing condition. The average yield from different spacings of the sunflowers in rows shows little variation between six inch and 18 inch distances. The hill plantings, however, yielded about a ton to the acre less than any of the others. With the mid-early and late seedings the 12 and 18 inch plantings made the highest yields.

Averages for the three plantings show that the early planting produced 10.09 tons to the acre, the mid-early planting 9.73 tons to the acre and the late planting 8.83 tons to the acre.

TABLE V.—Showing the yields of sunflowers for four years at the Sandpoint Substation, Sandpoint, for several dates of planting and various spacings of plants.

Date of Planting	Spacing in Row	Yields in Tons Per Acre					Average for Dates of Planting
		1922	1923	1924	1925	Ave.	
Early	6 inches	6.15	10.31	14.58	11.28	10.58	
	12 "	5.40	10.04	14.58	11.77	10.44	
	18 "	3.45	11.41	13.26	12.73	10.21	
	Hill	4.50	9.90	11.61	10.42	9.11	10.09
Mid-early	6 "	4.05	13.47	10.61	9.96	9.52	
	12 "	4.35	13.47	12.76	9.96	10.14	
	18 "	4.74	13.07	12.43	9.82	10.01	
	Hill	4.26	12.65	11.94	8.11	9.24	9.73
Late	6 "	3.60	12.10	10.51	8.03	8.56	
	12 "	4.20	12.65	10.48	8.42	8.94	
	18 "	4.35	11.88	10.34	8.11	8.67	
	Hill	4.65	10.32	8.75	5.58	7.33	8.38

Cultivation

Sunflowers will seldom need more than two cultivations as the plants grow rapidly, and if planted thickly soon shade the ground and check further growth of weeds. Less diffculty is experienced in controlling weeds in sunflowers than in corn.

Even though early cultivation is desirable it is not advisable to harrow sunflowers just after they emerge as is often the practice with grain crops. Sunflower plants are very brittle and easily injured at this stage of growth. If the seedbed has been thoroly prepared, the plants will be large enough to cultivate by the time the weeds get started. A cultivator equipped with "duck feet" shovels is very satisfactory for cultivating sunflowers provided the seedbed has been well prepared. In hard ground or on sod land a more pointed type of shovel gives best results.

When to Harvest

Sunflowers should be harvested for silage after the seed of the earliest

flowers has gone into the dough stage. Some growers harvest the crop a little earlier, and in any event it should be harvested before the seed has formed unless killed by frost. Frosted sunflowers should be siloed as quickly as possible to prevent loss of leaves. If harvesting is delayed until seeds are fully matured, the stalks become hard and woody and a silage is obtained which is unpalatable and not relished by livestock.

On the other hand, early harvesting of the crop produces a silage that contains too high a percentage of moisture. Under such conditions considerable juice is lost, which means a loss of soluble food nutrients. It

Harvesting sunflowers with a corn binder at University Farm, Moscow.

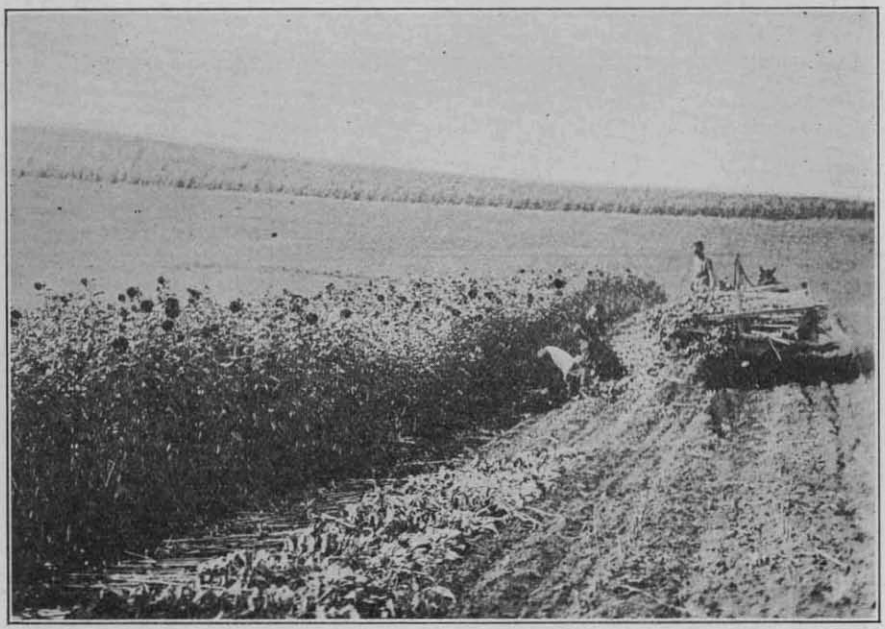
is generally considered that a high moisture content usually indicates acid silage, but according to investigations by the department of agricultural chemistry this does not hold true of sunflower silage.

Methods of Harvesting

Sunflowers are more difficult to harvest than corn because the heavy heads make the plant top heavy. This often causes considerable trouble in cutting with a corn binder, as the plants, if very tall, swing forward as they are cut, causing poor binding of bundles. In ground that is very loose and mellow it is often difficult to use a binder as the shallow rooted plants are pulled up instead of being cut off smooth.

On ground that is firm and fairly level it is possible to handle plants from 8 to 12 feet in height with a low built corn binder, but on rolling and loose ground it is necessary to resort to hand cutting or to use a corn sled.

One of the advantages of thick planting is that it reduces the size of the stalk and the height of the plant which facilitates harvesting with a corn binder. Bundles should be small if the crop is bound or cut by hand, otherwise they are heavy and difficult to handle. Hay racks make a convenient carrier for moving the crop to the silage cutter. If the bundles are laid on the rack so that all the heads are at one side, they can be fed into the cutter with greater ease. Plants should be fed into the cutter heads first. They are thus more easily handled as the stalks following will carry them into the cutter.



Harvesting sunflowers by hand at the University Farm, Moscow.

Because of the high moisture content, it is not usually necessary to add water to the crop when siloing. In case the crop is very mature or has been killed by frost and become somewhat dried, it may be necessary to add some water as the crop is packed into the silo.

Sunflower silage stores more compactly than corn silage. Thus the weight per cubic foot is greater and the pressure on the silo proportionately more. Some reports have been received of silos, which had been

satisfactory in former years when filled with corn, giving way when sunflowers were siloed. This factor should not be overlooked, and all braces should be refitted before filling with sunflowers.

Place in the Rotation

Since the sunflower is a cultivated crop its place in the rotation will depend upon other cultivated crops grown in the locality. In the non-irrigated sections of the state the crop would probably be followed by either winter or spring grain. In the irrigated sections where beets or potatoes are grown in the rotation, sunflowers could follow one of these crops to good advantage. Where these crops are not grown, sunflowers may be planted after a legume crop is turned under, or just preceding the grain crop.

In the cut over lands of northern Idaho, sunflowers should follow the small grain crop. Owing to the necessity of seeding winter wheat in late August or early September in those locations, this crop should not follow sunflowers in the rotation as it delays seeding of wheat. It would be possible, however, to follow the sunflower crop with a spring grain.

In the Palouse section sunflowers should be followed by spring grain rather than by winter grain. Yields of winter wheat following sunflowers have been much below those secured when other crops precede. This effect is shown in the following table.

TABLE VI.—Showing the comparative yields of winter wheat after corn and sunflowers at the Idaho Agricultural Experiment Station, Moscow, 1924-1925 inclusive.

Crop	Yield Bushels Per Acre 1924	1925	Average
Corn	30.3	47.0	38.7
Sunflowers	12.5	30.3	20.8
Difference in favor of corn			17.9

On the other hand the yield of spring wheat after sunflowers has been nearly normal. Such a condition is undoubtedly due to the excessive amount of moisture and plant food used by the sunflower in its growth. This would indicate that the land needed a rest until spring to enable moisture and plant food to again become available.

Comparative Value of Corn and Sunflower Silage

A considerable difference of opinion exists as to the relative value of corn and sunflowers for silage purposes. One of the questions most frequently asked is the comparative feeding value of the two. Data published by the department of agricultural chemistry of the Idaho Agri-

cultural Experiment Station shows the comparative analyses of the two crops to be as follows:

TABLE VII.—Showing the comparative analyses of sunflowers and corn.

	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract
Sunflowers	78.5	2.4	2.4	5.8	9.8	1.1
Corn	73.7	1.7	2.1	6.3	15.4	0.8

These analyses show that sunflowers have a higher moisture content than corn. This accounts for the fact that water seldom has to be added to sunflowers in silage making. Sunflowers are slightly higher than corn in ash, protein and fat. Corn has a higher crude fiber content and is substantially higher in nitrogen-free extract.

Digestion experiments conducted by the same department with cattle and sheep resulted in this conclusion: "when sunflower silage is compared with mature corn it is seen that the cows utilize slightly less protein from the sunflowers than from corn silage, whereas sheep utilize similar amounts."

Some farmers have had difficulty in getting cattle to eat sunflower silage. For the most part, however, this has not been a serious factor and after a few days the animals usually eat it readily. Salt is sometimes added during the silage making process. When salt is added it should be used at the rate of one fourth to one half pound to one hundred pounds of silage. This makes the silage more palatable and there is less waste in feeding.

Sunflower silage may be fed as soon as needed. In case it is not to be fed immediately it should be capped with some other material to prevent spoilage. Sunflower silage is fed in amounts similar to those of any other silage. In experience at the Sandpoint Substation, no harmful effects have been noticed when the silage is fed to milk cows. Furthermore, no disagreeable flavors have been imparted to milk coming from cows fed this silage.

SUMMARY

1. Sunflowers, because of their high yield and resistance to drought and frost, are a valuable silage crop in many sections of Idaho.
2. The choice between corn and sunflowers as a silage crop for any locality will depend upon their comparative yields and ease of handling.
3. The Mammoth Russian sunflower has proved a very satisfactory variety for silage in this state.
4. At Moscow sunflowers have yielded over 72 per cent more silage than corn. Under Sandpoint conditions sunflowers have outyielded corn by 303 per cent.
5. Mid-early planting, because of the longer growing season, has given the highest yields of sunflowers at Moscow. At Sandpoint with its shorter seasons, early plantings are best.
6. Thickly seeded stands have given the highest yields.
7. Less difficulty is experienced in controlling weeds in sunflowers than in corn.
8. Sunflowers should be harvested for silage after the seed of the earliest flowers has gone into the dough stage. If frosted they should be harvested as quickly as possible.
9. Sunflowers should not precede winter wheat in the rotation.
10. Analyses of sunflowers and corn show that they are nearly equal in feeding value.