SUMMER COVER CROPS IN POTATO PRODUCTION

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Potato growers in the Hastings, Florida area have followed the practice of growing a summer cover crop since the beginning of Hastings' commercial potato production in the 1890's. Potatoes are usually grown on the same land every year during the winter and spring and a cover crop is grown during the summer and fall. This cropping system has sufficiently maintained soil fertility and crop productivity to make it economically profitable for most farmers in most years.

Cover crops perform important beneficial functions such as protecting the soil from dispersion by raindrops, reducing soil temperature and providing residues for maintenance of organic matter in the soil. The soil organic matter is a reservoir of chemical elements such as carbon, nitrogen, phosphorus, sulfur and iron. Also, organic matter exerts an influence on soil aggregation which determines tilth, aeration, water-holding capacity and permeability (1, 2, 3).

Several different cover crops have been grown in the Hastings area. In the early days corn was planted on the side of the row at the last cultivation of potatoes and cowpeas were sometimes broadcast at the last cultivation of corn. Sesbania and hegari were first planted at Hastings in the late 1930's and today are the principal cover crops. Sesbania, a legume which reseeds itself, grows well on wet soils while hegari grows well on dry soils.

A cover crop study represents one of the experimental approaches undertaken at the Potato Investigations Laboratory in attempting to provide information for improving productivity of old land. The purpose of this paper is to report preliminary results on the effects of different summer crops on potato yields.

EXPERIMENTAL PROCEDURE

A 6x6 latin square cover crop experiment was set up on Bladen loamy fine sand and Coxville fine sandy loam in April 1955. It included the following six cover crops: cattail millet, Egyptian wheat, popsorghum, regular hegari, sesbania and Texas ribbon cane. All of the crops except sesbania were planted with a Planet-Junior at the rate of 10 pounds per acre in ridged rows 40 inches apart and six inches high. Sesbania was broadcast by hand at 30 pounds per acre and covered up by lightly raking soil over the seed. High atmospheric temperatures near the soil surface killed most of the sesbania seedlings but a good stand of volunteer crabgrass was established.

The dry weights of the tops of the cover crops were determined at 83 days after planting by cutting a three foot section of cover crop in the row, weighing, drying and reweighing.

The plots, four rows by 60 feet, were fertilized with 2,500 pounds of 6-8-8 per acre and planted with 2,000 pounds of whole Sebago seed-pieces per acre on January 11, 1956.

The cover crop experiment was relocated in May 1956 to soil mapped predominantly as Bladen loamy fine sand with smaller areas of Bladen fine sandy loam and Leon fine sand. It was also expanded to include a wireworm study and the following eight cover crops: cattail millet, corn, corn and velvet beans, Egyptian wheat, regular hegari, sesbania, Texas ribbon cane, and volunteer crabgrass and weeds. Cover crops were planted on May 28, 1956 and April 29, 1957. The dry weights of the tops and roots were determined on the 1957 crop but not on the 1956 crop. The dry, dead cover crops were cut down with a stalk cutter and listed under the soil on October 11, 1956 and October 10, 1957.

Potatoes were fertilized with 2,200 pounds per acre of 7-9-9 using the potato planter. A small trench was made in the center of the row with a wing-type plow. Potatoes were planted January 22, 1957 by hand in 40-inch rows at eight-inch spacings in plots four rows x 28 feet. Potatoes in the two center rows of each plot were harvested on April 24, 1957. The yield values given in Table 2 are means of 15 replicates of each cover crop.

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TABLE 1.- Effect of Summer Cover Crops in 1955 on Potato Yields in 1956.

Type of Cover Crop	Cover Crop Tops, Tons/A	Potato Yields, Cwt./A		
		U.S. 1A	U.S. 1B	1A & 1B
Egyptian Wheat	5.0	122.2	26.9	149.1
Cattail Millet	4.6	102.5	31.6	134.1
Popsorghum	4.4	101.0	27.4	128.4
Sesbania & Crabgrass	2.3	102.2	21.1	123.3
Regular Hegari	3.7	91.2	28.4	119.6
Texas Ribbon Cane	4.8	81.5	26.9	108.4
L.S.D. (5% Level)		22.7	5.4	21.3
L.S.D. (1% Level)		31.0	7.4	29.1

TABLE 2.- Potato Yields in 1957 and Summer Cover Crop Weights in 1957.

Type of Cover Crop	Potato Yields, Cwt./A			Cover Crops, Tons/A	
	U.S. 1A	U.S. 1B	1A & 1B	Tops	Roots
Corn	165.3	42.7	208.0	1.9	0.7
Cattail Millet	161.6	40.4	202.0	1.9	1.1
Regular Hegari	158.7	42.9	201.6	1.5	0.6
Corn & Velvet Beans	157.3	43.8	201.1	2.1	0.8
Volunteer Grass & Weeds	150.2	39.4	189.6	2.0	0.7
Egyptian Wheat	148.9	40.1	189.0	1.6	0.5
Texas Ribbon Cane	144.7	35.7	180.4	1.5	0.9
Sesbania	107.5	40.9	148.4	2.1	0.6
L.S.D. (5% Level)	21.8	5.8	21.8		
L.S.D. (1% Level)	28.8	7.4	28.8		

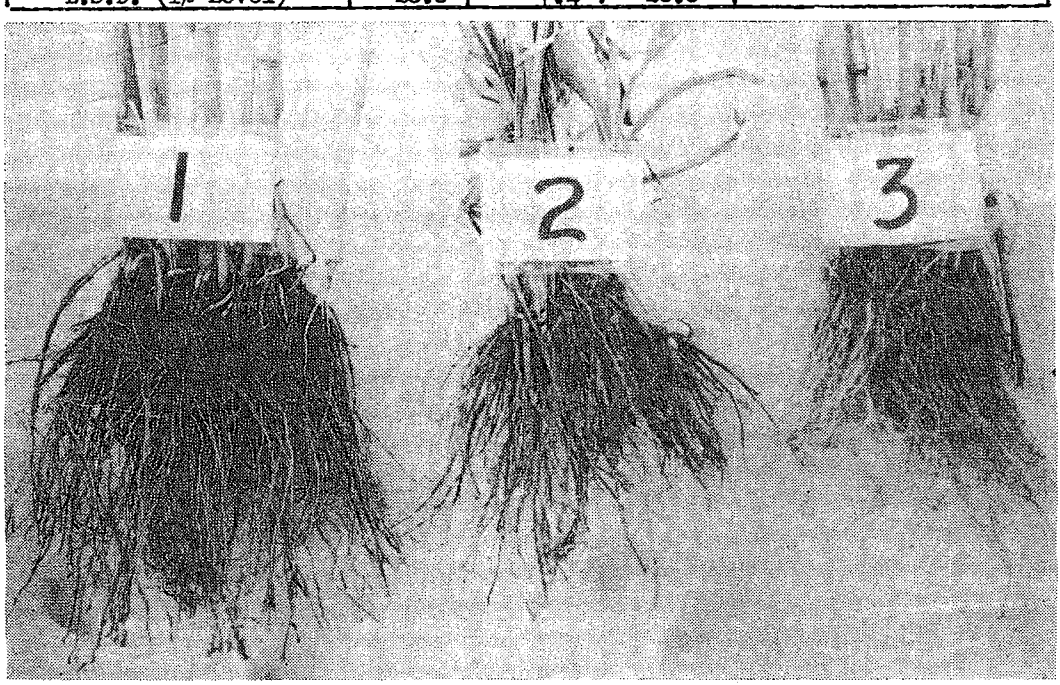

Fig. 1. Root systems of (1) Texas ribbon cane, (2) hegari, and (3) cattail millet.

Results and Discussion

Egyptian wheat, Texas ribbon cane, cattail millet, popsorghum, regular hegari, and sesbania and crabgrass added 5.0, 4.8, 4.6, 4.4, 3.7 and 2.3 tons of dry tops per acre, respectively, as given in Table 1. The root systems of Texas ribbon cane, hegari and cattail millet are shown in Fig. 1. Cattail millet had an extremely fine, massive array of rootlets while Texas ribbon cane and hegari had a coarse root system.

Yields of potatoes are also given in Table 1. Potato yields were 15 to 41 hundred-pounds per acre higher following a summer crop of Egyptian wheat than those following cattail millet, popsorghum, sesbania and crabgrass, regular hegari and Texas ribbon cane.

Yields of potatoes in 1957 following the 1956 summer cover crop of corn, cattail millet, regular hegari, corn and velvet beans, volunteer crabgrass, Egyptian wheat, Texas ribbon cane and sesbania were 208, 202, 202, 201, 190, 189, 180 and 148 hundred-pounds per acre, respectively, as given in Table 2. Yield of potatoes following sesbania was significantly lower (one percent level) than yields of potatoes following other crops.

At present no good explanations can be advanced to explain why potato yields are much higher following some cover crops than others. Experiments are underway to determine the rate of decomposition of different cover crops in the soil, the method of incorporating the cover crop into the soil and the fertility changes occurring in the soil.

The weights of the 1957 summer cover crop roots and tops are also given in Table 2. The accumulative effect of the 1956 and 1957 cover crops grown in the same plots should be reflected in the 1958 potato yields.

In conclusion, two facts stand out as significant concerning the effect of cover crops on potato yields. First, the kind of cover crop residue added to the soil exerts a greater influence on potato yields than does the quantity of cover crop added to the soil. The 1957 potato yields show that a corn summer cover crop results in the highest potato yields. Second, different cover crops have markedly different kinds of root systems which apparently have different effects on soil aggregation.

LITERATURE CITED

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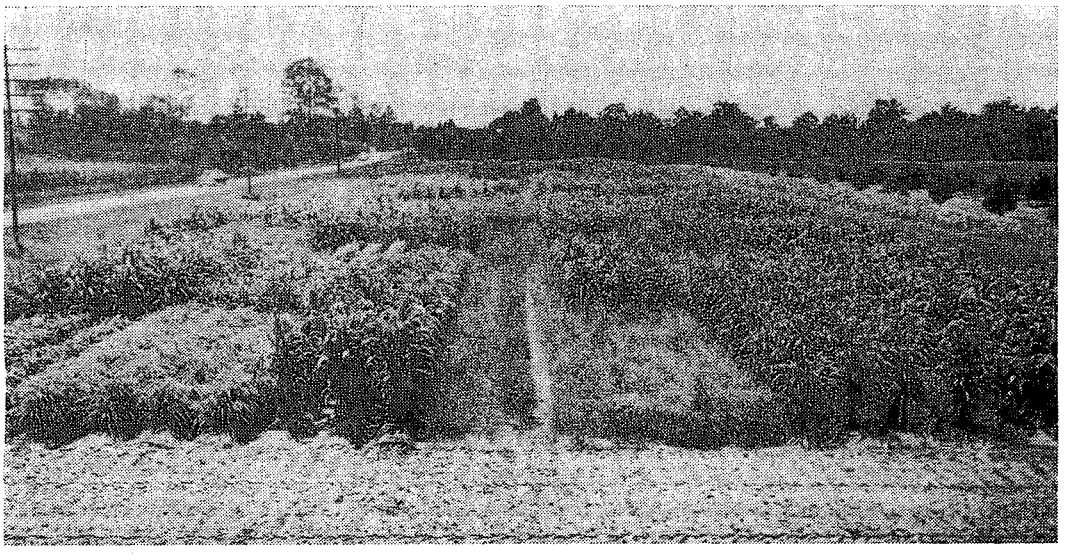

Fig. 2. Cover crop plots, August 1956.