Vegetable Section

INFLUENCE OF VARIETY AND POPULATION DENSITY ON YIELD AND POD COLOR OF POLE BEANS[1]

M. O. THOMAS[2]

INTRODUCTION

Pole bean production is an important economic segment of the economy of South Florida. In 1964-65, about 6,000 acres of pole beans were produced in Dade County. The total value of this crop was in excess of 4.5 million dollars.

The literature offers little information relative to the effect of population density on the yield and quality of pole beans. Duncan (2), Cramer and Jackobs (1) have reported on the relationship between population and yield in corn. They have presented mathematical models for predicting optimum plant density and maximum corn yields. Matthews (3) working with snap and lima beans showed that yield per plant decreased with an increase in plants per unit area. The yield per unit area increased as the populations per unit area increased, and the two varieties of snap beans responded differently to the variations of spacing under the conditions of the experiment.

MATERIALS AND METHODS

Four varieties of pole beans, Dade, SES-2, Kellogg McCaslan and McCaslan-42, were planted on January 12, 1965 on Rockdale soil. The statistical design was a randomized, split plot, replicated four times. Each plot consisted of two rows 3′ apart and 75′ long.

The seed was planted with a mechanical planter. The seeds for population A were spaced 2½″ x 3′ for a population of 69,677 plants per acre, population B, 4½′ x 3′ for 38,710 plants per acre, and population C, 9″ x 3′ for 19,355 plants per acre. Standard cultural practice for the area were used to grow the crop to proper maturity.

The pods were harvested at the peak of condition for prime green beans, on March 16, 19, and 24, 1965. The beans from each plot were weighed and recorded. A random sample of 10 bean pods was taken from each plot during the second harvest period and color determinations were made immediately. All the pods were oriented in the same manner and a 30mm cross-section removed from the center of the pod. The section was placed in a special scanning chamber for the Color Analyzer Reflectance Attachment for the B & L Spectronic 20 Colorimeter. The instrument was calibrated with a white porcelain standard at 525 mu, and readings were taken with the bean sections substituted for the standard.

RESULTS AND DISCUSSION

The color data were analyzed, and the results are summarized in Table 1. The results would indicate that there was no significance difference in the color of bean pods due to differences in population. There was a significant difference in color due to variety. Dade produced the darkest green pods and McCaslan-42 the lightest pods of the four varieties. SES-2 and Kellogg McCaslan were intermediate. Schewfelt and Dennison (4) have shown that Gardener color difference readings were useful in determining variations among varieties and processing treatments. It would seem that a quantative approach is a desirable objective in the evaluation of such biological phenomena.

The yield data for each harvest date and population were analyzed and the results are summarized in Table 2. The data would indicate that Dade produces about one-third its total yield on the first harvest at each *population* density. The yield of Kellogg McCaslan and Mc-

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[1]Florida Agricultural Experiment Stations Journal Series No. 2207.
[2]Sub-Tropical Experiment Station, Homestead, Florida.

Table 1. Reflectance appearance determination of bean pods.

Variety	Average color evaluations/plot, Population A	B	C	Total	
Dade	25.8	26.0	23.7	25.2	N.S.
SES-2	27.3	26.0	26.4	26.5	N.S.
Kellogg McCaslan	26.8	28.8	27.6	27.7	N.S.
McCaslan-42	30.5	30.7	29.5	30.2	N.S.
	*	*	*	*	

Lower values indicate darker green color.
* Significantly different at the 5% level.

Table 2. Average yield of beans per treatment for the first, second, and third harvest periods.

Variety	Population A, Harvest, lbs/plot			Population B, Harvest, lbs/plot			Population C, Harvest, lbs/plot		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Dade	34.16	33.00	29.94	32.41	30.96	27.19	16.69	25.38	20.81
SES-2	11.10	72.75	37.60	10.84	49.81	24.75	8.75	36.88	25.29
Kellogg McCaslan	1.22	86.00	39.28	4.88	64.72	27.36	5.22	42.97	29.63
McCaslan-42	2.25	29.75	44.56	1.19	29.10	44.86	.93	14.81	32.81
	**	NS	NS	**	**	**	**	*	NS

* Significantly different at the 5% level.
** Significantly different at the 1% level.

Table 3. Total yield of beans in pounds per acre.

Variety	Pounds of beans per acre, Population A	B	C
Dade	10,855	9,583	6,108*
SES-2	10,728	8,291	6,883*
Kellogg McCaslan	10,757	9,417	7,553*
McCaslan-42	8,532	7,291	4,718*
	*	*	*

* Significantly different at the 5% level.

Caslan-42 was concentrated in the second and third harvest, with SES-2 intermediate.

The total yield for four varieties and three populations is summarized in Table 3. The data would indicate that there is a significant difference in yield between varieties and between population densities. No variety population density interaction is indicated.

Summary

Four varieties of pole beans at three population densities were evaluated on Rockdale soil for pod color and yield.

The pod color of pole beans was not affected by population density, but there was a significant difference in pod color between varieties.

Dade, SES-2 and Kellog McCaslan gave higher yields than McCaslan-42. As the population per acre was increased the yield increased for each variety. In order to take full advantage

of the yield capabilities of Dade, strict attention should be given to three harvest periods.

LITERATURE CITED

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EFFECT OF VARIOUS SHADES AND SEASONS ON CELERY SEED GERMINATION AND SEEDLING GROWTH[1]

V. L. GUZMAN[2]

ABSTRACT

High soil temperatures during the summer and fall prevent celery seed germination. Celery seedbeds are therefore protected with muslin shade curtains. Since this type of shade and its manipulation are expensive, different types of papers, burlap, cheesecloth, excelsior, saran, polypropylene fabrics, and live plant shades were tried. Promising results were obtained with tar paper, woven paper and burlap. When using permanent structures (similar to those used for growing mums), woven paper, saran and polypropylene fabrics gave best results. Soil surface temperature reduction by the various shades and percent germination were closely related. As solar radiation diminishes from summer to late fall, the necessity for protection also decreases. When it decreases to the point where the solar energy incident upon the black organic soil is not enough to raise its surface temperature above 96.5° F., shade is no longer necessary .

INTRODUCTION

During the warmest months in south Florida, it is essential to protect the celery seedbeds with muslin cloth or curtains (2) for successful seedling production. This method is reliable but expensive. A curtain 300 x 6 feet retails for $68.00. The cloth must be treated to resist rot, and wires must be attached to each side. About 30 so-called A-frames are needed to support one curtain (Fig. 1). Each frame costs approximately $1.00. Life expectancy of the curtain and A-frame is three years. In addition, handling and manipulation of the curtains during the growing of the seedlings are labor-consuming operations.

It has been discovered that failure of celery seed to germinate without protection is due to high soil surface temperature (1). If the temperature could be held below 96.5° F. (preferably 90° F.) utilizing less costly materials and labor than those currently used, this would result in an economic benefit to the farmer. A variety of materials and live plant shades were tested to determine their effect on germination and growth of the seedlings.

MATERIALS AND METHODS

The experiments were conducted in a well decomposed peaty muck soil of the Florida Everglades. Two series of tests were carried out, one with low temporary structures supported by stakes and wire called "low series" (Fig. 2)

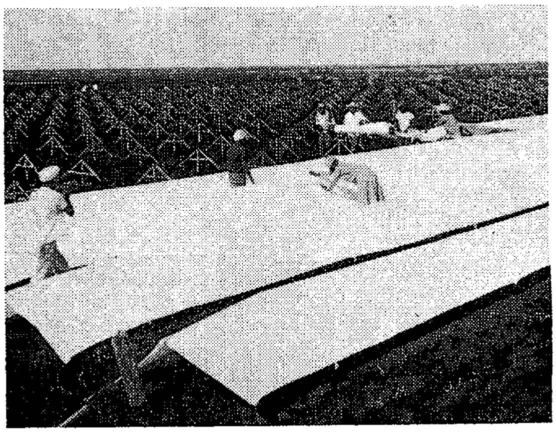

Figure 1.—Commercial celery seedbeds each 300 x 4 feet planting area, protected by muslin curtains on *A-frames.* A large number of frames and man-hours is needed to manipulate the shades.

[1]Florida Agricultural Experiment Stations Journal Series No. 2243.

[2]Associate Horticulturist, Everglades Experiment Station, Belle Glade, Florida.