CARIBBEAN FOOD CROPS SOCIETY

PROCEEDINGS

ELEVENTH ANNUAL MEETING

EFFECT OF PLANTING DATE ON SOYABEAN OIL AND PROTEIN IN TRINIDAD[1]

by

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INTRODUCTION

The soyabean *(Glycine max* (L.) Merrill) is grown mainly for its seeds which contain oil and protein of high biological value. These seed chemical constituents are known to vary with changing planting dates, but in Trinidad, where the crop is currently the subject of much research, there is little information in the literature on these effects. Inconclusive data for oil content for two planting dates in Trinidad were reported by RADLEY (1968). This paper presents more extensive data concerning oil and protein contents and yields of two soyabean varieties as influenced by different planting dates during a year.

MATERIALS AND METHODS

The experiment was conducted on cambered beds on River Estate Loam (pH 5.7 and low in major nutrients) at the University Field Station, Champ-Fleurs, Trinidad. Inoculated seeds of soyabean varieties ACADIAN and F62/3977 were sown by hand at exactly four-week intervals throughout a twelve-month period commencing 23rd October, 1968. Plots were thinned, within two weeks of planting, to 7 cm. between plants in a row giving a plant population of approximately 235,000 plants per ha.

[1]A paper prepared for the Eleventh Annual Meeting of the Caribbean Food Crops Society held in Barbados from 1st to 7th July, 1973. This paper is a portion of a Ph.D thesis submitted to the University of the West Indies in February, 1972.

Table 1.

Effect of planting date on seed oil and protein contents (percentage on a moisture free basis) of two soyabean varieties

	OIL		PROTEIN	
	Acadian	F62/3977	Acadian	F62/3977
	±1.01		±1.00	
October	19.5 c*	22.5 b	43.0 b	42.0 ab
November	21.0 bc	25.0 a	44.1 a	43.0 a
December	22.0 b	24.3 ab	44.0 a	44.0 a
January	23.0 b	21.1 bc	45.4 a	44.1 a
February	22.0 b	26.9 a	44.2 a	42.7 a
March	27.1 a	21.4 b	47.3 a	39.0 b
April	17.0 d	19.7 c	44.0 a	43.0 a
May	17.6 d	20.4 c	43.6 b	40.6 b
June	18.1 c	19.7 c	38.8 c	42.5 a
Early July	18.3 c	20.5 c	44.0 ab	40.4 b
Late July	18.8 c	21.9 b	46.1 a	44.7 a
August	17.9 cd	22.8 b	42.4 b	39.9 b
September	19.4 c	20.1 c	45.7 a	45.3 a
Varietal Means (± 0.28)	20.1	22.0 (± 0.28)	44.0	42.4
Coefficient of Variation	9.6%		4.6%	

*Means in the same column with the same letter do not differ significantly at the 5% probability level based on Duncan's Multiple Range Test.

Table 2.

Effect of planting date on seed oil and protein yields (kg./ha.) of two soyabean varieties.

	OIL		PROTEIN	
	Acadian	F62/3977	Acadian	F62/3977
	± 37.0		± 55.7	
October	348 b*	487 a	768 ab	913 a
November	422 ab	501 a	866 a	847 a
December	329 bc	416 ab	656 b	758 b
January	202 c	309 bc	400 d	643 bc
February	272 c	239 c	548 c	378 d
March	543 a	538 a	843 a	987 a
April	331 b	228 c	859 a	496 cd
May	219 c	255 c	540 c	506 c
June	246 c	385 b	525 cd	835 a
Early July	259 c	338 b	622 bc	677 b
Late July	256 c	392 b	629 b	799 ab
August	80 d	243 c	189 e	422 d
September	174 cd	337 b	410 d	763 b
Varietal Means (± 10.3)	283	359 (± 15.4)	604	693
Coefficient of Variation	23.1%		17.2%	

* Means in the same column with the same letter do not differ significantly at the 5% probability level based on Duncan's Multiple Range Test.

The experimental design was a randomised block with four replications. Each plot consisted of seven rows 9 metres long spaced 53 cm. apart. A 13:13:20 commercial compound fertilizer at the rate of 376 kg./ha. was broadcast and lightly raked into the soil before the plantings. Irrigation was used during dry periods, and three hand weedings and weekly sprayings with Dipterex SP 80 (Dimethyl 1-hydroxy 2 trichloro ethyl phosphonate) at a concentration of 3g per l and a rate of 300 litres per ha, were carried out during the growth of each crop.

Plants from an area 11.9 m^2 of each plot were harvested and threshed by hand. The winnowed seeds at 13% moisture were used for estimating plot yields. Duplicate samples of these seeds from each plot were analysed for oil content, gravimetrically using a standard Soxhlet unit with petroleum ether as solvent, and total Nitrogen content, using a micro-Kjeldahl procedure – Protein was estimated as total nitrogen X6.25. Oil and protein yields were computed by multiplying the seed yields by the oil and protein contents.

RESULTS

The effects of planting date on seed oil and protein contents in the two soyabean varieties are shown in Table 1. For both constituents, analysis of variance showed highly significant differences between varieties, planting dates and the variety X planting date interaction.

Seed oil and protein yield data are summarised in Table 2. There were highly significant differences between varieties and dates of planting in both attributes. The variety X dates interaction was significant at 5% and 0.1% probability levels for oil and protein yields respectively.

Correlation coefficients between seed oil and protein contents were non-significant for both varieties.

Correlation coefficients were computed for some meteorological factors (daylength, total sunshine hours and mean, minimum and maximum temperatures) and agronomic characters (growing period, period

of full bloom to harvest, seed size and seed yield) with seed oil and protein contents. None were significant for ACADIAN. For F62/3977, associations significant at the 5% probability level, were shown by seed oil content with daylength (r = - 0.596) and growing period (r = - 0.554), and seed protein content with seed size (r = +0.679).

DISCUSSION AND CONCLUSION

The seed oil and protein contents and yields varied considerably with both planting date and variety, a finding in agreement with the many reports (BYTH and WAITE, 1962; CARTTER and HARTWIG, 1963; TANG, 1965; RADLEY, 1968) from different countries where planting date studies in the soyabean have been conducted. The highest oil and protein contents were not necessarily produced at planting dates which gave the highest oil and protein yields in either variety. Only in ACADIAN was the highest seed oil content and the highest oil yield produced at the same planting date.

Daylength varies by only ninety minutes over the year in Trinidad but showed a negative correlation with seed oil content in F62/3977. HOWELL (1963) in the United States of America reported that temperature variations affected the composition more than the yield of seed, but the present results show no such association. Temperature variations in Trinidad may not be large enough to influence oil and protein synthesis in the seed.

Consistent with JOHNSON, et al (1955) a negative association between growing period and seed oil content, typical for most American varieties, was recorded for F62/3977, and in contrast with many workers (JOHNSON and BERNARD, 1963) there was no association between oil content and period of full bloom to harvest. For the various planting dates, large seed size was associated with high seed protein content in F62/3977 and it is probable that both seed protein content and seed size responded similarly to an external factor.

Numerous investigators have reported a negative correlation between seed oil and protein contents (JOHNSON and BERNARD, 1963) but this

relationship does not always occur (HOWELL, 1963), as shown by the present study. F62/3977 of Florida, U.S.A. appeared the better adapted variety and produced consistently more oil but apparently less protein than ACADIAN which was bred in Louisiana, U.S.A.

The data show that varying planting dates produced different effects on the seed oil and protein contents and yields of the two varieties, and the highest values of these attributes were obtained from the October, November and March plantings.

SUMMARY

A planting date study was conducted on soyabeans *(Glycine max* (L.) Merrill) at the University Field Station, Trinidad to provide data on the variation of seed oil and protein contents and yields. Seeds of varieties ACADIAN and F62/3977 were planted at four-week intervals on 13 successive dates commencing 23rd October, 1968.

Significant differences were observed between the varieties, planting dates and the variety x dates interaction for oil and protein contents and yields. Oil contents ranged from 17.0 to 27.1% (ACADIAN) and from 19.7 to 26.9% (F62/3977) and protein contents from 38.8 to 47.3% (ACADIAN) and from 39.0 to 45.3% (F62/3977). Oil yields ranged from 80 to 543 kg./ha. (ACADIAN) and from 228 to 538 kg./ha (F62/3977) and protein yields from 189 to 866 kg./ha. (ACADIAN) and from 378 to 987 Kg./ha (F62/3977). In F62/3977 only, oil and protein contents showed associations with some meteorological factors and agronomic characters. In general this variety produced consistently more oil but apparently less protein than ACADIAN. Plantings in October, November, March and April in ACADIAN and October, November and March in F62/3977 gave the highest oil and protein yields.

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