Effects of Depodding and Light Intensity on Soybean (*Glycine Max* (L.) Merrill) In South West Nigeria

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ABSTRACT

A study was undertaken to obtain information on the performance of depodded soybean under reduced light intensity prevalent in South West Nigeria during the season of soybean cultivation. Soybean plants were subjected to 0, 10, 20 and 40% depodding at the R5 stage of growth and grown simultaneously under 75, 50 and 100% daylight regimes for two weeks. The 100% light regime served as control. Depodding engendered a greater accumulation of chlorophyll in the leaves of depodded plants. Yield was reduced in depodded plants and the magnitude of reduction increased with increasing severity of pod removal. Depodding interacted with light intensity such that the effect of reduced light intensity on soybean was made more pronounced. Depodded plants grown under subdued light intensities had higher chlorophyll concentration than plants depodded and grown under the 100% light regime. Similarly, field grown plants (which received lower photon flux) had a higher chlorophyll level than pot grown plants. It is likely that several factors in addition to light interacted to determine the magnitude of chlorophyll production in soyabean. The lower light regimes had relatively little impact on the vegetative growth of soyabean apparently because of the advanced stage of growth in which the treatments (depodding and light regimes) were imposed on the plants.

Keywords: Soyabean, depodding, light intensity, chlorophyll concentration, R5 stage.

INTRODUCTION

In spite of the vast potentials of soyabean, its production in south west Nigeria is still constrained by a number of problems which include limitations posed by soil and other environmental factors. The shading effect of taller intercrops and the overcast skies during the production season of soyabean in this area could limit the performance of the crop as was the case in other parts of the world. (Prine, 1976; Sumarno, 1987; Jiang and Egli, 1993 Board & Harville, 1993; Fu, 1994). Similarly, pod damage by insects and pathogens also accounts for a sizeable reduction in yield of the crop (Buntin *et al.*, 1995). Wittenbach (1982) found that depodding soyabean just prior to seed development and pod-fill resulted in considerable increase in leaf dry weight, affected leaf soluble protein but not total proteolytic activity. In similar manner, Crafts-Brandner *et al.*, (1984a) found a decrease in the chlorophyll concentration of depodded soyabean plants and asserted that the activity of ribulose bisphosphate carboxylase (RuBPcase) and chlorophyll began to decline at about the same time. Odeleye *et al.*, (2001) also found that reduced light intensity was detrimental to the development of soyabean at the vegetative, early flowering and pod filling stages of growth with shading at the pod filling stage being the most damaging to crop performance.

This study assessed the effects of reduced light intensity and depodding on the performance of soyabean.

MATERIALS AND METHODS

Cage construction:

The cages used for the pot and field trials were made of 5cmx5cm wood. The internal dimensions of each cage were 1.8m x 1.2m x 1.3m. The wooden frames were covered on all sides with single or double layers of synthetic, green, 1mm mesh net to reduce light intensity by 25 or 50%, respectively. The light intensities within and outside the screens were measured (in lux) using a light meter Model 4555 type C

(Megatron, England).

Pot Experiment

The experiment involved superimposing reduced light intensity regimes on depodded soyabean at the R5 stage of growth. It was carried out between April and July, 1995 on the roof top of the Department of Crop Protection and Environmental Biology, University of Ibadan.

The seeds of three soybean varieties TGx 1485-1D (early maturing, V1) TGx 849-313D (Medium maturing, V2) and Malayan, (late maturing, V3) were obtained from the International Institute of Tropical Agriculture and planted in pots on 7 April, 1995. A total of 1.47g of N.P.K (15: 15: 15) was added to 3.95kg soil in each pot, representing a rate of 50kg N.P.K per hectare

At 7-8 weeks after sowing (WAS), plants of TGx 1485-1D reached the R5 stage of growth (the early pod filling stage of soyabean as described by Fehr and Caviness (1977)). The plants were depodded (0, 10, 20, and 40% of pods on each plant) and transferred into the light reducing cages. The varieties TGx 849-313D and Malayan reached the R5 stage at 9-10, and 11 WAS, respectively. The plants were similarly depodded and transferred into the cages. Plants sampling started after two weeks of treatment and weekly thereafter. Data were taken on number of leaves, leaf area, and stem height number of pods, dry weights of leaf, stem, roots, and total dry weight. Data were also taken on number of seed bearing pods plant^{-1}, total seeds plant^{-1}, seed dry weight plant^{-1} and leaf chlorophyll concentration (mg/g) plant^{-1}. Dry weight measurement of the various plant parts were taken after oven drying the plant samples at 80°C for 48hr.

Chlorophyll Extraction and Measurement

Chlorophyll extraction and measurement were also done from composite samples obtained from the second and fourth leaves on the plants. The second and fourth leaves were chosen for standardization and to represent equally relatively young and relatively old leaves. The standard procedures of Arnon as used by Hang *et al.*(1984) were employed for chlorophyll extraction. The absorbance of chlorophyll extracts were measured against acetone blanks using the Pye Unicam Sp6- 250 visible spectrophotometer. The amount of chlorophyll in the leaves of plants were determined using Arnon formula (Hang *et al.*, 1984):

$$C = (20.2 \times D\,645 + 8.02 \times D663) \times 50/1000 \times 100/5 \times 1/2$$

Where: C = chlorophyll concentration,
D 645 = Absorbance at 645 nm (Chlorophyll a),
D 663 = Absorbance at 663 nm(Chlorophyll b).

Field experiment

The field was divided into 3 main plots (6.0x5.6m each), 9 sub plots (6.0 x1.4m each) And 27 sub- sub- plots (2.0 x 1.4 m each) replicated five times. The soyabean varieties were randomly allocated to main plots, the depodding treatments to subplots and the light regimes to sub sub plots.

The seedlings that resulted from the planted seeds of soyabean were thinned to one per stand with a spacing of 60 cm x 5 cm. Fertilizer was applied at 2 WAS at the rate of 50 kg/ha. Weeding was done at 3, 6 and10 WAS. TGx 1485-1D, TGx849-313 D and Malayan reached the R5 stage on the field at 7-8, 9-10 and 11 WAS, respectively. They were subsequently subjected to the depodding and light treatments as in the pot experiment. Data were also taken as in the pot experiment.

RESULTS

Pot experiment

The medium maturing variety, V2, had a lower leaf area than the late maturing variety,V3 while the early maturing variety,V1 had the lowest leaf area following treatment. V3 was the tallest of the three varieties and had the highest number of pods (Table 1) . The dry weights of leaves ,stem and roots of V2 were significantly higher than those of V1 and V3. At plant maturity, the pod dry weight plant^{-1} of V2 (21.36g) was significantly higher than the pod dry weights of V1 and V3 (18.34 and 20.62, respectively) (Table 1).

The depodded plants had larger leaf area than undepodded plants with leaf area increasing with severity of pod removal. The numbers of pods of plants given 0 and 10% pod removal were not significantly different. Similarly, the numbers of pods of plants subjected to 20 and 40% pod removal were also not significantly different. (Table 1). The control plants produced heavier pods than plants in which pods were removed with the most severely depodded plants having the lowest pod dry weight and total plant dry weight at maturity.

Plants grown throughout in the open had a larger leaf area and a higher number of pods than plants grown under subdued light for two weeks. There was a reduction in dry weight of the various plant parts with reducing light intensity. Plants grown under 75% light intensity (L1) produced heavier plant parts than those under 50% light intensity (L2)(Table 1).

The number of seeds plant^{-1} of V2 and V3 were each significantly higher than that of V1, although total seeds plant^{-1} of V3 was lower than that of V2. Both P2 and P3 had lower values of seed bearing pods plant^{-1} and total seeds plant^{-1} than P0 and P1 plants.

Plants grown in the open (L0)(100% light intensity) had more seed-bearing pods, total seeds and higher seed dry weight than L1 and L2plants. Generally, L1 plants had higher values of these yield parameters than L2 plants even though the differences were not statistically significant (Table 2).

V1 had higher chlorophyll concentration than V2 and V3. P2 and P3 plants (most severely depodded plants) had significantly higher chlorophyll concentrations than P0 and P1 plants. The L0 plants had higher chlorophyll concentration in their leaves than L1 and L2 plants (Table 2).

The soyabean varieties produced lower seed-bearing pods at the lower light intensities. The combinations of the lowest light intensity and the highest pod removal produced the lowest number of seed bearing pods(P3L2= 58.20). The seeds plant^{-1} of V2L1 and V2L2

Table 1. Effects of variety, depodding and light intensity on leaf, stem and pod characteristics of soyabean grown in pots, at maturity.

	Number of leaves/ plant	Leaf area (cm^2)/ plant	Stem height (cm)/ Plant	Number of Branches /Plants	Number of Pods/plant	Leaf dry Weight (g)/plant	Stem dry Weight(g)/ plant	Root dry Weight (g)/plant	Pod dry Weight (g)/plant	Total dry weight (g)/plant
Variety		880.7								
V1	24.53	0.0	28.10	6.53	48.63	5.58	5.34	2.20	18.34	32.84
V2	0.0	0.0	41.24	7.33	74.75	0.0	11.95	2.77	21.36	36.44
V3	0.0	-	43.42	7.90	83.73	0.0	11.50	1.95	20.62	33.06
LSD (P=0.05)	-		1.05	0.28	2.2	0.17	0.32	0.17	0.4	0.54
Depodding		0.0								
P0	0.0	0.0	42.60	7.63	84.33	0.0	11.38	2.14	21.45	35.23
P1	0.0	0.0	42.93	7.50	83.66	0.0	11.30	2.25	21.90	35.65
P2	0.0	0.0	41.84	7.77	75.93	0.0	11.19	2.54	20.29	34.24
P3	0.0	0.0	41.95	7.57	73.10	0.0	10.83	2.54	20.33	33.88
LSD (P=0.05)	0.0		1.49	0.39	3.11	0.0	0.46	0.24	0.56	0.76
Light Int.		0.0								
L0	0.0	0.0	43.55	7.83	88.45	0.0	12.02	2.20	24.52	38.97
L1	0.0	0.0	41.23	7.63	74.20	0.0	11.20	2.56	19.82	33.87
L2	0.0	0.0	42.21	7.40	75.08	0.0	10.31	2.30	18.64	31.42
LSD (P=0.05)	0.0		1.29		2.7	0.0	0.40	0.21	0.48	0.66

V1, V2 and V3= early maturing, medium maturing and late maturing soybean varieties respectively; P0, P1, P2 and P3 0, 10, 20, and 40% depodding, respectively; L0, L1 and L2= 100, 75 and 50 % light intensities, respectively.

Table 2:Mean values of chlorophyll concentration at the early pod filling stage and yield characters at maturity, of depodded soyabean grown under varying light intensities.

Pot trial				
Treatment	Number of seed bearing pods plant $^{-1}$	Total seeds plant $^{-1}$	Seed dry weight (g) plant $^{-1}$	Chlorophyll concentration (mg/g)plant $^{-1}$
V1	46.1 ± 0.7	96.2 ± 1.7	10.83 ± 0.12	6.58± 0.31
V2	72.7 ± 1.2	158.8 ± 2.6	14.75 ± 0.33	3.81 ± 0.15
V3	81.2 ± 1.8	155.6 ± 4.7	13.92 ± 0.37	3.63 ± 0.14
LSD (P=0.05)	2.1	6.4	0.61	0.06
P0	69.4 ± 3.2	144.0 ± 6.6	13.31 ± 0.54	4.50 ± 0.15
P1	68.7± 3.1	141.3± 6.4	13.43 ± 0.41	4.23 ± 0.26
P2	65.2 ± 2.3	131.7 ± 4.9	12.89 ± 0.30	5.10 ± 0.35
P3	63.4 ± 2.1	130.2 ± 4.7	13.04 ± 0.41	4.86 ± 0.44
LSD (P=0.05)	2.4	7.4	0.70	0.07 ±
L0	74.0 ± 2.9	154.4 ± 5.8	14.92 ± 0.43	4.26 ± 0.18
L1	63.7 ± 1.8	128.0 ± 3.9	12.00 ± 0.26	4.41 ± 0.22
L2	62.4 ± 1.9	128.0 ± 4.1	12.00 ± 0.27	5.35 ± 0.37
LSD (0.05)	2.1	6.4	0.61	0.06

V1, V2 and V3= early maturing, medium maturing and late maturing soybean varieties respectively; P0, P1, P2 and P3= 0, 10, 20, and 40% depodding, respectively; L0, L1 and L2= 100, 75 and 50 % light intensities, respectively.

Table 3: Mean separation of significant two-way interactions for yield characters and chlorophyll concentration (mg/g) of depodded soybean grown under varying light intensities in pots.

	Number of seed- bearing pods plant $^{-1}$				Total seeds plant $^{-1}$				Seed dry weight plant $^{-1}$				Leaf Chlorophyll concentration mg/g plant $^{-1}$			
	P0	P1	P2	P3	P0	P1	P2	P3	P0	P1	P2	P3	P0	P1	P2	P3
V1	45.6	44.1	47.8	46.9	96.5	94.0	95.4	98.8	10.6	10.8	11.0	10.9	4.7	5.6	7.5	3.2
V2	73.3	76..5	69.1	71.8	158.3	169.9	148.3	158.5	14.7	15.5	13.7	15.1	4.8	3.7	3.6	3.2
V3	89.1	85.6	78.6	71.6	177.1	160.1	151.5	133.5	14.6	14.0	14.0	13.1	4.0	3.4	4.1	3.0
	LSD(P=0.05) =3.6				LSD(P=0.05) = 12.7				LSD(P=0.05) = 1.1				LSD(P=0.05) = 0.1			
	L0	L1	L2		L0	L1	L2		L0	L1	L2		L0	L1	L2	
V1	46.9	47.5	44.0		98.9	97.1	92.6		11.0	11.1	10.4		5.4	5.8	8.9	
V2	60.3	69.5	68.3		176.8	148.6	150.9		17.3	13.9	13.1		3.6	4.0	3.9	
V3	94.9	74.0	74.9		187.7	138.4	140.5		16.5	12.7	12.6		3.8	3.4	3.6	
	LSD(P=0.05) = 3.6				LSD(P=0.05) = 11.1				LSD(P=0.05) = 1.1				LSD(P=0.05) = 0.1			
	L0	L1	L2		L0	L1	L2		L0	L1	L2		L0	L1	L2	
P0	82.9	63.8	61.3		171.1	134.5	126.3		16.1	12.2	11.7		4.4	3.9	5.2	
P1	74.5	66.2	65.4		157.1	132.4	134.5		14.8	12.9	12.5		3.2	4.2	5.3	
P2	69.3	61.8	64.5		146.2	120.2	128.8		14.7	12.4	12.1		5.21	5.0	5.1	
P3	69.3	62.9	58.2		143.3	124.9	122.5		14.7	12.8	11.9		4.2	4.5	5.8	
	LSD(P=0.05) = 4.2				LSD(P=0.05) = 12.8				LSD(P=0.05) = 1.2				LSD(P=0.05) = 0.1			

V1=TGX 1485-1D, TGX 849- 313D, V3=Malayan; P0, P1, P2 and P3 = 0, 10, 20 and 40% deppodding, respectively; L0, L1 and L2 = 100, 75 and 50% light intensities, respectively. The LSD values were calculated when interaction was significant from the ANOVA based on the Statistical Procedures of Gomez and Gomez 1984

Table 4 Effects of variety, depodding and light intensity on leaf stem and pod Characteristics of soybean at maturity on the field.

Treatment	Leaf Area (cm ^{2}) /Plant	Stem Height (cm) /Plant	Number of Branches /Plant	Number of pods /plant	Leaf dry Wt.(g) /plant	Stem dry wt (g) /plant	Root dry wt(g)	Pod dry wt.(g) /plant	Total dry wt (g) /plant
Variety									
V1	0.0	32.84	9.25	76.77	0.0	8.64	1.47	31.61	42.63
V2	0.0	52.97	13.33	172.28	0.0	18.07	2.22	46.69	67.95
V3	0.0	59.02	15.23	179.42	0.0	22.47	2.04	50.73	75.95
LSD (P= 0.05)	0.0	0.58	0.31	0.93	0.0	0.31	0.06	0.43	0.68
Depodding									
P0	0.0	57.10	14.97	19.20	0.0	21.41	2.07	50.92	74.94
P1	0.0	55.96	14.40	19.00	0.0	20.50	2.16	49.28	72.77
P2	0.0	55.5 6	14.23	18.67	0.0	20.02	2.11	47.92	70,87
P3	0.0	55.29	13.33	18.37	0.0	19.15	2.17	46.71	68.93
LSD (P=0.05)	0.0	0.81	0.43	0.34	0.0	0.43	0.08	0.60	1.00
Light Int.									
L0	0.0	54.84	15.13	188.50	0.0	21.77	2.15	52.08	76.95
L1	0.0	55.93	13.88	169.48	0.0	19.58	2.07	47.70	70.27
L2	0.0	57.21	13.85	169.58	0.0	19.46	2.17	46.35	68.42
LSD (P=0.05)	0.0	0.70	0.37	1.68	0.0	0.38	0.07	0.52	0.83

V1, V2 and V3= early maturing, medium maturing and late maturing soybean varieties respectively; P0, P1, P2 and P3= 0, 10, 20, and 40% depodding, respectively; L0, L1 and L2= 100, 75 and 50 % light intensities, respectively.

were similar but significantly lower than that of V2L0. The seeds plant^{-1} of P0L1 and P0L2 were similar but significantly lower than that of P0L0. The same applies to higher levels of depodding.(Table 3). The seed dry weight of V3P1, V3P2 and V3P3 were similar but lower than the seed dry weight of V3P0. The seed dry weight of V3P3 was statistically significantly lower than that of V3P0. The seed dry weights of V2L1 and V2L2 were also similar but significantly lower than that of V2P0. The seed dry weight of P0L1 and P0L2 were similar but significantly lower than that of P0L0 (Table3).

The chlorophyll concentration of V1L2 was higher than that of V1L1 which was in turn higher than that of V1L0. Similarly, V2L2 had more chlorophyll than V2L1 and V2L0. Furthermore, P0L2 had more chlorophyll than P0L1and P0L0. The differences were significant. This trend of variation also occurred at the other levels of depodding.

FIELD EXPERIMENT

The leaf area of V3 plants was larger than that of V1 and that of V2.The tallest variety was V3, while V1 was the shortest. V3 had the highest number of branches and pods. The dry weights of leaves, roots and pods and total dry weight of V3 were significantly higher than those of V2 (Table 4).

All plants, both depodded and undepodded, had no leaves at final harvest. The undepodded

Table 5 : Mean values of chlorophyll concentration at the early pod filling stag and yield characters of depodded soy Bean grown under varying light intensities.

Field trial

Treatment	Number of seedbearing pods plant^{-1}	Total seeds plant^{-1}	Seed dry weight (g) plant^{-1}	Chlorophyll concentration (mg/g)plant^{-1}
V1	71.2 ± 0.8	153.7 ± 1.3	24.33 ±0.3	8.71 ±0.4
V2	171.4 ± 1.8	227.6 ± 4.1	39.11 ±0.4	6.23 ±0.22
V3	176.8 ± 1.8	350.2 ± 15. 1	39.20 ±0.3	4.81 ±0.2
LSD (P= 0.05)	1.5	3.8	0.4	0.03
P0	149.9 ± 8.6	289.09 ±15.4	34.59 ±1.2	6.46 ±0.4
P1	139.8 ± 7.2	285.09 ±14.0	35.05 ±1.1	6.06 ±0.5
P2	136.1 ± 6.9	272.18 ±13.1	33.88 ±1.0	6.23 ±0.3
P3	133.4 ± 7.1	255.69 ±12.1	33.33 ±1.2	7.57 ±0.4
LSD (P=0.05)	1.7	4.3	0.4	0.03
L0	149.3 ± 7.1	292.72 ±13.3	36.09 ±1.0	6.60 ±0.3
L1	135.4 ± 6.1	267.67 ±10.9	33.90 ±0.9	5.68 ±0.2
L2	134.8 ± 6.2	266.15 ±11.1	32.64 ±0.9	7.46 ±0.4
LSD (0.05)	1.5	3.8	0.4	0.03

V1, V2 and V3= early maturing, medium maturing and late maturing soybean varieties respectively; P0, P1, P2 and P3= 0, 10, 20, and 40% depodding, respectively; L0, L1 and L2= 100, 75 and 50 % light intensities, respectively.

plants however grew significantly taller and had more pods than depodded plants (Table 4).

The control plants had significantly higher stem dry weight than the depodded plants at final harvest and at this time , the stem dry weight reduced with increasing severity of depodding and the differences were significant. Pod dry weight and total dry weights of soybean were such that the variation was P0 >P1 >P2 >P3 at plant maturity (Table 4).

L2 plants had the largest leaf area throughout the growth period after treatment. L2 plants were the tallest while L0 plants were the shortest during the same period. The L0 plants produced the highest number of pods compared with L1 and L2 plants.

The leaf and stem dry weights of L0 plants were higher than those of plants grown under reduced light intensities. The pod and total dry weights of L0 plants were significantly higher than those of L1 and L2 plants (Table 4).

The most severely depodded plants produced the lowest number of seeds plant^{-1} (Table 5). Similarly, severe pod removal caused significant depression of seed dry weight in field grown plants. Plants grown in the open produced more seed- bearing pods and total seeds plant^{-1} than plants grown under reduced light intensities.

The chlorophyll concentration of V1>V2>V3. The order of chlorophyll concentration for defoliated plants was P3 > P2 >P1 with differences significant (Table 5).

On the field, the number of seed-bearing pods of V3P3 was significantly lower than that of V3P2. The varieties produced lower seed bearing pods, the higher the level of depodding. The total number of seeds of undepodded plants

Table 6 . Mean separation of significant two way interactions for yield characters and chlorophyll concentration (mg/g) of depodded soyabean grown under varying light intensities on the field.

	Number of seedbearing pods Plant^{-1}				Total seeds plant^{-1}				Seed dry weight plant^{-1}				Leaf chlorophyll concentration mg/g plant^{-1}			
	P0	P1	P2	P3	P0	P1	P2	P3	P0	P1	P2	P3	P0	P1	P2	P3
V1	72.1	72.9	72.0 7	67.7	156.7	157.2	153.5	147.3	24.5	25.2	24.9	23.7	8.6	7.4	8.6	10.2
V2	186.9	171.6	163.9	163.2	328.5	337.4	309.4	382.1	39.1	40.1	37.7	39.5	5.3	7.1	5.8	6.7
V3	190.5	174.8	172..5	169.3	382.1	360.7	353.6	304.3	40.2	39.8	39.0	37.8	5.4	3.8	4.3	5.8
LSD	2.3				7.5				0.8				0.7			
	L0	L1	L2		L0	L1	L2		L0	L1	L2		L0	L1	L2	
V1	75.4	69.9	68.4		98.9	152.9	148.6		25.6	24.6	22.8		8.3	7.0	10.9	
V2	184.0	164.9	165.4		3507	311.6	307.8		42.0	38.6	36.7		5.6	5.7	7.43	
V3	188.5	171.4	170.6		3679	338.5	344.2		40.7	38.5	38.4		6.0	4.4	4.1	
LSD	2.5				6.5				0.6				0.1			
	L0	L1	L2		L0	L1	L2		L0	L1	L2		L0	L1	L2	
P0	169.5	141.4	138.7		331.1	270.9	265.3		38.8	33.3	31.7		6.7	5.1	7.6	
P1	145.5	136.7	137.1		303.6	276.3	275.3		35.9	35.1	34.1		4.9	4.7	8.6	
P2	142.9	132.0	133.5		286.3	266.2	264.1		34.6	34.2	32.7		7.2	5.9	5.6	
P3	139.2	131.3	129.7		249.9	257.3	259.9		35.1	33.0	32.0		7.7	7.0	8.1	
LSD	2.9				7.5				0.7				0.1			

V1=TGX 1485-1D, V22=TGX 849-313D, V3=Malayan; P0, P1,P2 andP3=0,10,20 and 40%deppodding,respectively; L0,L1 andL2=100, 75 and 50%light intensities, respectively. The LS D values were calculated when interaction was significant from the anova based on the statistical procedures of Gomez and Gomez (1984)

was significantly higher than those of depodded plants with the most severely depodded plants having the lowest number of seeds. The depodding x light intensity interaction was such that the total seeds of P0L1 and P2L2 were similar but each was significantly lower than that of P0L0 (Table 6). A similar trend outlined above was observed in seed dry weight for the various interactions. The varieties had higher chlorophyll concentrations with increasing severity of pod removal, but lower chlorophyll with reducing light intensity. The variation of chlorophyll concentration P3L2>P3L1>P3L0 was (Table 6).

DISCUSSION

Pod removal resulted in apparent inhibition of senescence and retention of chlorophyll in the leaves of soybean in this study. This is similar to the findings of Wittenbach (1982) in which depodded soyabean had longer leaf area duration and retained high levels of chlorophyll. As a result of fewer pods due to depodding, the pods probably had reached their carrying capacity in terms of assimilate absorption hence the leaves became secondary sink. This could be responsible for the heavier leaves in these treatments as reported by Wittenbach (1983) and Crafts - Brandner *et al.*, (1984).

Depodding did not engender an appreciable post -depodding vegetative growth in soyabean varieties used in this study due to the emphasis of the plants at the R5 stage in concentrating assimilate supply to the remaining pods on the plants at the expense of vegetative structures. Pods generally exert very strong pull on assimilates and at the pod filling stage when the depodding treatment was carried out in this study, the tendency was for the plants to supply assimilates to the remaining pods on the plants. As a consequence of this, each pod must have received more assimilate than if the plants had not been depodded provided depodding itself did not affect the plant capacity for assimilate production.

The pod removal treatment, which led to a reduction in pod number, agrees with the report of Egli and Legget (1976) who recorded a decline of 20% in pod number by depodded soyabean over the control. However, the reduction in pod dry weight or dry matter accumulation associated with pod removal contrasts the report of Kim *et al.*, (1993) in which depodding increased the dry matter of the various plant parts of depodded soybean. This difference might be due to the additional reduced light intensity imposed on depodded soyabean in this study.This is vividly so on the field where the depodded plants grown throughout under 100% daylight had higher values of pod dry weight than depodded plants grown for two weeks under 50 and 75 % light intensities.

It has been shown that growing soybean under reduced light intensity caused reduced level of chlorophyll formation in its leaves (Sunarlim 1985; Karczmarczyk and Devlin 1985 and Odeleye *et al.*, 2001). However, depodding led to a higher accumulation of chlorophyll in depodded plants in this study which did not translate into higher yield. This may be because photosynthesis had been somewhat impaired probably as a result of retarded protein synthesis, breakdown of RNA and DNA and other cellular components, which are intrinsic symptoms of senescence that is the norm at advanced stages of plant growth. The increased chlorophyll concentration occasioned by pod removal at the R5 stage of soybean growth was therefore not associated with increased efficiency of carbon assimilation. This agrees with the report of Mondal *et al.*,(1978) and Crafts Brandner *et al.*,(1984) that longer leaf area duration brought about by pod removal did not cause increased photosynthetic rate.

Furthermore, depodded plants under reduced light intensity actually accumulated more chlorophyll than plants grown throughout under 100% daylight, both in pots and on the field. The reduced sink strength caused a decrease in the flow of assimilate to the remaining pods on the plants thus bringing about an accumulation of assimilates in the leaves. Aside from this, the interaction of depodding x light intensity had affected source sink balance such that the most severely depodded plants produced the highest chlorophyll concentration under the lowest light intensity. This showed that the depodding treatment had a more pronounced effect on soybean compared with light intensity in terms of chlorophyll concentration

The depodding x light intensity interaction for stem height was not significant apparently because the plants were subjected to the pod removal and reduced light treatments at an advanced stage of reproductive growth. This showed that the light regimes had relatively little impact on stem height at the R5 stage of growth. The variety x light intensity interaction was consistently highly significant for number of seed-bearing pods indicating that light on one hand and the combined effects of depodding and light on the other hand had pronounced effects on soyabean pod development at the R5 stage of growth.

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