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RESPONSE OF COWPEA (*vigna unguiculata* (L.) Walp) GENOTYPES TO SOWING DATES AND INSECTICIDE SPRAY IN SOUTH EASTERN NIGERIA

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ABSTRACT

Cowpea productivity is generally hampered by insect pest attacks. Integrating host plant resistance, insecticide treatment and adjusting sowing date have been advocated as effective means of tackling insect pest menace on cowpea. Nine improved cowpea genotypes along with a local check were subjected to different sowing dates and agro-chemical treatments with the aim of determining their levels of response especially when exposed to zero insecticide treatment. Treatments were laid out in split-plot design with three replications across two years and locations. Results showed that when insecticide was not applied, yield and yield components were significantly ($P<0.001$) higher in early than late season presumably due to escape of genotypes from pest attacks. Untreated plots in late season resulted in zero grain yield for most genotypes. The genotype IT98K-131-2 was tolerant to the prevailing insect pests as it produced high grain yield of 770.5 kg ha^{-1} without chemical treatment across early and late season sowing. Grain yield of the rest of the genotypes were inconsistent across spray regimes, seasons and locations. The genotype IT97K-556-4 was the most responsive genotype to agro-chemical treatment producing significantly ($P<0.001$) higher grain yield when sprayed with insecticide and the least grain under zero spray. The genotype IT93K-452-1 gave significantly ($P<0.001$) higher 100 seed weight with or without insecticide treatment during both seasons and locations. Insecticide treatment significantly increased days to maturity and pod filling in late season at both locations while it significantly reduced days to flowering in Ishiagu location suggesting that agro-chemical treatment promoted grain yield in cowpea through delayed maturity and prolonged pod filling duration.

Key words: Cowpea, sowing date, insecticide spray, host-plant resistance, southern eastern Nigeria.

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp.) considered as "poor man's meat" is an important component of the food intake of the less developed countries of the world because of its high protein content (Jaritz, 1991). Cowpea is a major food legume in central and West Africa where more than 60% of world cowpea were cultivated. The total world production of dry cowpea in 2002 was about 5 million tones from 14 million ha of which 64% was produced in West and Central Africa. The dry savannah region of Nigeria alone produces 2-1 million tones from 5 million ha (Grubben and Denton, 2004). Southeastern Nigeria, unfortunately, accounted for only about 0.57% of the total cowpea production and 0.38% of the total area cultivated in Nigeria in 2007 (APS, 2008). The low level of cowpea production in the region is mainly due to lack of access to improved varieties, high incidence of insect pests and poor crop management practices. Most of the cowpea seeds consumed in southern Nigeria are brought in from the northern part of the country although southeastern region has favorable weather and soil that can sustain commercial production. The bulk of the diet of rural and urban poor African people consists of starchy food made from cassava, yam, cocoyam, millet, sorghum, and maize. The addition of even a small amount of cowpea ensures the nutritional balance of the diet and enhances the protein quality by the synergistic effect of high protein and high lysine from cowpea and high methionine and high energy from the cereals. Cowpea fixes atmospheric nitrogen up to 240 kg/ha and leaves about 60-70 kg nitrogen for successive crops (Nkaa *et al*., 2014). This can reduce the need for application of nitrogenous fertilizers that are detrimental to the environment. Biological nitrogen fixation is environmentally friendly and ideal for sustainable agriculture (Chenge, 2008).

Insect pests cause maximum damage to cowpea from seedling stage to grain storage. Insect pest attack in cowpea often leads to total yield loss. Use of insecticides improves the yield of cowpea tenfold (Ajeigbe and Singh, 2006). Jackai *et al*. (2001) pointed out that traditional cowpea growers in Nigeria do not habitually use insecticides, as reflected in the poor yields they obtain.

Sowing dates and insecticide treatment have some potential in influencing the incidence of insect pest infestation and crop performance. These cultural practices, when combined with the use of host-plant resistance, are the most effective measures against low cowpea productivity and insect pest infestation. They are used as cost effective components of integrated pest management package (Karungi, *et al.,* 2000). The value of manipulating the planting date as a package for optimizing cowpea productivity have been confirmed, thus giving scientific credence to the traditional practice of planting early in the season than late planting (Jackai and Adalla 1997).

Although IITA has developed different categories of cowpea; they have not been fully tested in Southeastern Nigeria to determine their performance when exposed to the entire pest complex under natural field infestation, either sprayed or not sprayed with insecticides and at different planting dates. It is hoped that identification of genotypes that produce reasonable grain yield without insecticide application can constitute a low input approach to solving the problem of low yield occasioned by high population of insect pests in the region, and also enhance the promotion of sound environmentally, ecologically and economically viable cowpea production option which will benefit resource poor farmers.

The aim of this study was to assess the performance of cowpea genotypes across different sowing dates and agro-chemical spray regimes, and to identify genotype (s) that are capable of producing appreciable yield without application of insecticide and those that are responsive to insecticide treatment.

MATERIALS AND METHODS

Experimental sites: The study was conducted across two years and at two locations within derived savanna agro-ecology of southeastern Nigeria, considered as non-traditional cowpea growing region. In each year early and late season sowing dates were utilized to assess the agronomic potentials of the cultivars. The two locations experiences bimodal rainfall pattern and they include Mgbakwu (06^0 17^0 N, 07^0 04^0 E; 83m asl) and Ishiagu (05^0 58^0 N, 07^0 34^0 E; 197 m asl). Mgbakwu location experienced an average daily temperature and relative humidity of 31^oc and 74 respectively with a total annual precipitation of 1571 mm in 2007 and 1638.1 mm in 2008. Ishiagu witnessed an average daily temperature and relative humidity of 31.5^o**c** and 81 respectively with a total annual precipitation of 1677.5 mm in 2007 and 1954.1 mm in 2008. The soils of Mgbakwu are predominantly sandy and acidic (pH 4.6) while that of Ishiagu are sandy loam soils and alkaline pH of 6.0.

Cultivars: Nine improved cowpea cultivars collected from IITA, and a local cultivar (check) were used in this study. The improved cultivars consisted of extra early (IT 93K-452-1), early (IT 84S-2246-4, IT 90K- 82-2, IT 97K-558-18) and medium maturing cultivars (IT 90K-277-2, IT 97K-499-35, IT 97K-556-4, IT 98K-131-2, IT 98K-205-8) (Dugje *et al*., 2009) while local check falls within long duration category.

Experimental procedures: The experimental plot was ploughed, harrowed and manually ridged. Prior to ridging, a basal dose of 100 kg NPK 15-15-15 per hectare plus 1000 kg per hectare of well cured cow dung was broadcast uniformly and later incorporated into the soil before ridging. Seed was dressed with fungicide (seed-plus) at the rate of one sachet (10 g) to two kg of seed. Inter-row spacing was 75 cm while intra row spacing was 25 cm; 2-3 whole-seeds per hill were sown at 3-5 cm depth. Plants were thinned to two stands per hill two weeks after crop emergence. Weeds were manually controlled as regularly as they appeared while other agronomic practices were carried out as recommended. Early and late season sowing dates were observed for the two years and at the two locations. In 2007, the experiments were established on July 23 for early season sowing and September 4 for late season sowing in Mgbakwu while at Ishiagu location, sowing was done on July 31 and September 12 for early and late season sowing respectively. In 2008, the experiment was established in Mgbakwu on July 21 and September 15 while sowing in Ishiagu was carried out on July 24 and September 12 for early and late season sowing respectively. Planting done before the month of August was considered early planting date while planting done after August was regarded as late planting date. The experiment was a split-plot arranged in a randomized complete block design (RCBD), replicated three times on a four row plots of 2 meter long, with insect control treatment as the main treatment plot while genotype constituted the sub-plot treatment. The main plot consisted of zero application of insecticide on one hand, and three applications each at flower bud initiation, full bloom, and at 50 percent podding stages. Each of the treatment blocks was separated by 1-meter alley to control drift of insecticides to uncontrolled plots in the neighboring block. Also, spray operation was done early in the morning when wind action was minimal. Insect pests were managed with the application of full dose of 100 ml of insecticide, cypermethrin and dimethoate mixture containing 30 g and 250 g active ingredients respectively, using 15 litres knapsack sprayer**.**

Data collection: The data were collected from the inner two rows in each replicate. Observations were recorded on growth (dry fodder weight and vine length), reproductive component (bloom, podfill, and maturity) and yield and yield components (100 seed weight, grain yield and harvest index). Days to 50% flowering/bloom was sampled when there was at least one flower in 50% of all plants in the plot. Duration of grain filling period was determined as days from 50 percent bloom to when the pods have reached physiological maturity (when the pods had reached their mature pod color). At maturity the yield and yield components were sampled from five randomly selected plants. Dry fodder weight was determined from the net plot after harvest and sun drying while the weight of 100 seeds was recorded by weighing a random sample of 100 seeds.

Data analysis: The data collected were subjected to analysis of variance (ANOVA) using GENSTAT Discovery Edition 2 (GENSTAT, 2005) procedures as outlined for RCBD. Means of cultivars were separated using Fishers least significant difference (F-LSD).

RESULTS

Results showed that effects due to spray regime did not differ significantly across most parameters sampled from early season at Ishiagu except harvest index and grain yield where treatment with agro-chemical spray resulted in significantly higher expression of the two traits (Table 1). Genotype responses to spray regime effects differed, with IT 90K-277-2 producing significantly higher dry fodder weight, maturity and 100 seed weight in both spray regimes. The genotype IT93K-452-1 produced the least dry fodder, earliest to bloom and mature, and expressed significantly lower grain yield. The genotype IT84S-2246-4 and IT90K-82-2 consistently resulted in significantly lower 100 seed weight in both spray regimes. The genotype IT98K-131-2 on the other hand produced significantly higher grain yield of 1120 kg ha^{-1} and 1319 kg ha^{-1} than other genotypes without spray and when sprayed with insecticide respectively. Local check did not flower because it is photo-sensitive and therefore could not produce any yield components. However, it produced significantly longer vines.

Table 2 indicated that zero spray regime resulted in significantly higher dry fodder weight but took shorter days to mature in late season at Ishiagu. Local check took longer days to bloom, mature and produced significantly longer vines in both spray regimes. Spray regime resulted in significantly higher yield and yield components than zero spray across all the genotypes. The genotype IT98K-131-2 exhibited superior grain yield attributes in both spray regimes with grain yield of 1043 kg ha^{-1} when sprayed and 421 kg ha^{-1} without spray. Yield and yield components were significantly affected by zero application of insecticide, with 100 seed weight ranging between 2.17 kg for IT84S-2246-4 to 10.02 kg for IT93K-452-1, while grain yield ranged from 54 kg ha-1 for IT84S-2246-4 and 421 kg ha-1 for IT98K-131-2. Harvest index followed similar trend with grain yield across the two spray regimes. Insecticide treatment significantly increased the number of days to pod fill in late season.

Like at Ishiagu location, effects due to spray regime did not differ significantly for most growth and yield components in early season in Mgbakwu except grain yield and harvest index that were marginally higher under spray regime across all the genotype (Table 3). Local check produced significantly higher vines in both spray regimes followed by IT90K-277-2. The genotype IT97K-556-4 gave significantly higher 100 seed weight and grain yield across the two spray regimes while the least grain yielder across the spray regimes was IT97K-499-35. The genotype IT98K-131-2 was the next highest grain yielding genotype when agro chemical was not applied.

Zero application of agro-chemical significantly reduced all the growth and yield components in late season at Mgbakwu except dry fodder weight that was higher under no spray conditions (Table 4). Application of agro-chemical significantly increased vine length, maturity, 100 seed weight, grain yield and harvest index. The genotype IT98K-131-2 produced significantly higher grain yield in both spray regimes, zero spray (117kg ha^{-1}) and 535kg ha^{-1} under spray treatment while local check produced no grain under zero spray treatment and gave the least grain yield (129kg ha^{-1}) when treated with insecticide. Local check was however, the latest to bloom and mature and like at Ishiagu location it produced significantly longer vines in both spray regimes. IT93K-452-1 was stable for 100 seed weight in both spray regimes while IT97K-556-4 gave significantly higher 100 seed weight when sprayed (18.57g). The genotype however gave the least 100 seed weight of 5.5g under zero spray indicating higher susceptibility of the genotype to insect pests. Insecticide treatment significantly increased days to maturity and pod filling in late season in both locations while it significantly reduced days to flowering at Ishiagu location. This is an indication that agro-chemical treatment increased grain yield through delayed maturity and elongated pod filling duration. Grain yield loss assessment was negligible in early season for all the genotypes while in late season it was 100 percent for local check, 34 percent for best yielding medium maturing genotype, IT98K-131-2 and 30 percent for best yielding extra early maturing genotype, IT93K-452-1.

Table 1. Effect of spray regime on growth and yield of cowpea genotype in early season combined across 2007 and 2008 in Ishiagu.

Genotype	Zero Spray								Spray							
	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI
IT 84S-2246-4	567	36.8	52.83	17	69.5	11.58	826	46.1	542	50.5	50.50	17	67.17	12.25	959	59.7
IT 90K-277-2	903	118.7	50.83	20	72.17	17.78	999	31.2	1000	103.7	49.67	23	72.5	17.75	1145	32.3
IT 90K-82-2	733	70.3	50.17	20	70	11.67	892	39.0	750	75	52.33	19	70.83	11.60	1063	52.0
IT 93K-452-1	292	71.7	39.17	21	60.33	16.42	660	90	305	59.7	41.33	19	60.67	16.23	955	75
IT 97K- 499 – 35	697	59.7	44.67	21	65.5	14.37	1023	38.7	583	64.3	43.33	21	64.5	15.05	1205	62.2
IT97K-556-4	792	78.7	51.33	19	70.5	16.9	1046	41.6	750	66.2	49.83	21	70.33	17.58	1261	60.2
IT97K-55568-18	708	82	48.17	20	68	15.12	906	29.4	683	112.5	46.83	22	68.67	15.27	979	49.1
IT98K-131-2	717	94	50.33	22	72.33	15.35	1120	61.9	533	84.5	49.67	23	71	15.5	1319	86.5
IT98K-205-8	600	85.2	43.67	21	64.17	15.52	1016	73.9	683	82.2	43	21	64	15.54	1031	45.9
LOCAL	608	185.2	0	0	0	0	0	0	753	186.2	0	0	0	0	0	0
MEAN	661.7	88.2	47.91	18	61.15	15.00	943.11	52.2	658.2	88.5	47.39	18	60.97	15.20	1101.89	58.1
F-LSD(0.05)	264.1	45.91	8.366	3.35	2.674	0.911	311.7	33.17	264.1	45.91	8.366	3.35	2.674	0.911	311.7	33.17

DFWT (g) = Dry fodder weight; VINELTH = Vine length, Bloom = Days to 50% flowering; PODFILL = Days to pod filling; 100 SWT = 100 Seed weight; GYD = Grain yield; HI = Harvest index

Table 2. Effect of spray regime on growth and yield of cowpea genotype in late season combined across 2007 and 2008 in Ishiagu

Genotype	Zero Spray								Spray							
	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI
IT 84S-2246-4	633	30	40.00	11	54.8	2.17	54	2	617	40.2	41.5	17	58.8	12.83	856	38.1
IT 90K-277-2	967	88.7	44	15	52.5	3.33	246	8.7	717	91.2	42.83	18	60.7	17.83	917	43.7
IT 90K-82-2	833	42.2	45.83	11	55	7.17	117	5.4	383	39.8	44.67	17	61.8	11.73	686	55
IT 93K-452-1	483	50	38.67	15	53.3	10.02	247	28.8	317	41.3	39.17	14	53.2	14.8	737	79.5
IT 97K- 499 – 35	500	52.3	42	14	54	4.83	114	9.9	400	37.5	40.17	18	57.8	14.13	567	66
IT97K-556-4	950	30.5	43.5	14	56.2	4.65	71	2.2	800	33.2	39.83	21	60.8	17.12	777	29.1
IT97K-55568-18	550	61.8	42.33	17	52.5	9.43	193	8.4	650	89.3	41.17	20	61.5	15.73	940	41
IT98K-131-2	567	77.8	43.33	18	61.7	8.33	421	20.8	533	76.8	39.83	19	58.8	14.67	1043	66.9
IT98K-205-8	550	68.5	41	18	59	9.23	231	16.3	367	40.8	39.67	20	59.2	14.45	584	51.4
LOCAL	383	140.7	55.00	22	76.3	0.00	0	0	755	195.3	59.5	33	78	16.67	291	17.6
MEAN	642	64.2	43.57	16	57.53	5.92	169	10.2	554	68.5	42.83	20	61.06	15.00	740	48.8
F-LSD(0.05)	212.8	35.58	6.732	5.92	17.91	5.093	260.3	21.35	212.8	35.58	6.732	5.92	17.91	5.093	260.3	21.35

DFWT (g) = Dry fodder weight; VINELTH = Vine length, Bloom = Days to 50% flowering; PODFILL = Days to pod filling; 100 SWT = 100 Seed weight; GYD = Grain yield; HI = Harvest index.

Table 3. Effect of spray regime on growth and yield of cowpea genotype in early season combined across 2007 and 2008 in Mgbakwu.

Genotype	Zero Spray								Spray							
	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI
IT 84S-2246-4	550	38.1	48.5	24	72.7	11.68	605	34.9	667	55.8	50.33	24	73.8	11.32	1091	52
IT 90K-277-2	675	135	50.17	25	75.2	18.43	701	59.9	508	152.4	50.83	25	75.7	17.92	799	60.6
IT 90K-82-2	300	36.8	53.17	21	74.5	12.72	691	78.6	362	44.6	53.83	20	74	11.87	939	95.82
IT 93K-452-1	342	93.3	41.83	22	64	15.98	760	90.3	233	103.4	41.33	22	63.7	16.62	967	98.9
IT 97K- 499 – 35	367	44.2	46.17	22	68.2	15.17	437	47.3	333	93.7	45.17	23	68.2	14.87	838	78.5
IT97K-556-4	1275	72.6	48.17	22	70.2	18.2	1263	48.4	650	42.2	49.83	23	72.5	19.13	1524	67.4
IT97K-55568-18	225	99	48.5	24	72.7	16.73	580	78.5	400	135.3	49.5	24	73	15.87	1003	84.3
IT98K-131-2	233	103	49.67	23	72.5	16.52	891	80	358	123	50	22	72.2	15.97	952	96.9
IT98K-205-8	717	975	44.5	23	67.3	15.73	657	50.1	458	76.3	45	24	68.5	15.82	858	52.9
LOCAL	1150	202	0	0	0	0	0	0	1192	235.8	0	0	0	0	0	0
MEAN	583	92.2	47.85	21	70.81	14.12	731.67	63.83	516	106.3	48.42	21	71.29	13.94	996.78	76.34
F-LSD(0.05)	598.3	56.6	2.962	6.82	17.49	1.08	426.7	45.21	598.3	56.6	2.962	6.82	17.49	1.08	426.7	45.21

DFWT (g) = Dry fodder weight; VINELTH = Vine length, Bloom = Days to 50% flowering; PODFILL = Days to pod filling; 100 SWT = 100 Seed weight; GYD = Grain yield; HI = Harvest index

Table 4. Effect of spray regime on growth and yield of cowpea genotype in late season combined across 2007 and 2008 in Mgbakwu.

Genotype	Zero Spray								Spray							
	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI	DFWT	VINE LTH	Bloom	Pod fill	Maturity	100 SWT	GYD	HI
IT 84S-2246-4	217	22.1	43.17	14	55.0	7.5	30	15.6	352	31.3	47.17	19	66.2	13.62	338	68.1
IT 90K-277-2	392	40.6	45.83	19	57.3	13.37	58	11.9	283	91.7	45.33	23	68.3	17.67	240	25.9
IT 90K-82-2	452	37.8	44.50	15	56.2	11.62	62	41	189	37.2	47.17	19	66.3	13	259	69.1
IT 93K-452-1	270	48.5	40.83	20	61.2	16	78	13.1	233	70.4	41.83	19	60.5	17.37	354	48.1
IT 97K- 499 – 35	273	27.3	41.33	15	52	10.33	43	14	232	32.4	40.67	24	65	16	346	88.7
IT97K-556-4	698	32.9	42.5	23	58.3	5.5	20	1.3	378	30.9	41.5	26	67.7	18.57	483	33.7
IT97K-55568-18	278	67.7	44	21	57.5	13.73	62	20.2	173	67.3	44.67	22	67	14.97	371	96.4
IT98K-131-2	307	52.3	42.83	24	66.3	14.42	117	26.7	244	49.4	44.67	23	67.2	16.27	535	84.6
IT98K-205-8	276	35.4	41.83	19	54.2	10.53	53	15	218	50.7	41.33	24	65.3	16.43	214	90.5
LOCAL	415	99.6	61.67	26	76.6	0	0	0	349	118.6	60.67	30	90.3	22.3	129	12.6
MEAN	358	46.4	44.75	20	59.46	10.3	52	17.64	265	58	45.5	23	68.38	16.62	327	68.63
F-LSD(0.05)	179.9	25.41	2.231	8.4	24.66	6.827	153.4	71.93	179.9	25.41	2.231	8.4	24.66	6.827	153.4	71.93

DFWT (g) = Dry fodder weight; VINELTH = Vine length, Bloom = Days to 50% flowering; PODFILL = Days to pod filling; 100 SWT = 100 Seed weight; GYD = Grain yield; HI = Harvest index

DISCUSSION

The result showed that in late season insecticide treatment reduced fodder yield while zero application increased fodder yield. This finding is in agreement with Ajeigbe *et al.* (2005) who reported that the reduction in fodder yield was partly because of greater grain yield and delay in cutting of the fodder due to multiple grain harvest resulting in the loss of leaves due to senescence. This was also the conclusion of Tarawali *et al.* (2002). Conversely, Schulz *et al.* (2001) observed that if cowpea is not adequately protected from insect damage, it produced less grain and more leaf and vine dry matter. Also, thrips and *Maruca* damage stimulated higher fodder production because photosynthates that would have been invested in flowers and pods are used for foliage development. Alghali (1991) confirmed that fodder production was enhanced by non-application of insecticides, and concluded that when pest attack is heavy and grain yield is minimized fodder production increased significantly.

Insecticides treatment was found to stimulate significantly longer vines in most genotypes particularly in late season at Mgbakwu location compared to untreated plots. This observation is a clear evidence that the insecticide used in this study was effective in controlling aphids which is believed to be responsible for stuntedness in cowpea growth. Ansari *et al.* (1992) revealed that delay in controlling aphids early in the growth and development of cowpea could result in stunted plant growth, lower foliage and poor quality fodder. Early to medium maturing genotypes produced more grain than fodder when compared to long duration local check. This result is supported by Singh *et al.* (2002) who reported that early and medium maturing varieties yielded higher grain but lower fodder than late maturing and fodder type cowpea.

Insecticide sprays resulted in earlier flowering of cowpea than unsprayed plot for most genotypes. This is in line with Ajeigbe *et al.* (2005) who explained that flower bud and flower abortions were reduced when cowpea was sprayed and this accounted for earlier flowering in the spray plots compared to untreated plots. The prolonged days to pod fill when insecticides was applied as observed in this study enhanced production of components of grain yield. The observed delay in days to maturity and pod fill when sprayed as against zero spray suggests that insecticides application in cowpea increased grain yield through the process of prolonged maturity and pod fill duration. The delay in maturity and pod fill provided ample opportunity for higher assimilate accumulation.

Application of insecticide significantly increased all the yield and yield components in late season. The yield increases implied that the major yield limiting pests were effectively controlled by the insecticides used in this study. Studies in West and East Africa have found application of insecticides to significantly reduce insect pest populations and increased the yield and yield components of cowpea (Karungi *et al.,* 2000). Yield and yield components were significantly higher in early season than late season under zero spray treatment. Akande *et al*. (2012) also made similar observation, and attributed the higher yield in early season without chemical spray to escape of cultivars from pests and diseases.

Insecticide spray positively affected the harvest index of cowpea with insecticide spray resulting in higher harvest index than zero spray treatment. This result is in agreement with Ajeigbe *et al.* (2005) who pointed out that insecticide spray improved the harvest index as a result of increased seed per pod, pod per plant and grain yield. Hall *et al.* (1997) stated that harvest index correlated positively with grain yield in cowpea. Apparently, any agronomic practices that promote higher harvest index would equally enhance grain yield. The damage caused by *Maruca* pod borer and pod sucking bugs in zero spray treatment was reduced or eliminated when the plants were sprayed, thereby increasing the harvest index. In early season however, spray regime did not significantly affect any of the yield and yield components, probably because of lowered insect pressure and better environmental variables. Insecticide application did not affect the resulting 100 seed weight implying that the higher grain yield obtained from sprayed treatment was as a result of higher formation of other grain yield components under sprayed treatment than unsprayed treatment. The untreated cowpea plots in late season resulted in zero grain yield for most genotypes. This finding is confirmed by Singh and Ajeigbe and Singh (2006) that insect pest attack on cowpea if left uncontrolled often leads to total yield loss especially in late season when insect pest pressure is usually at the peak.

Conclusion: This study revealed that cowpea genotypes subjected to varying spray regime and sowing dates responded differently to these treatments. Significantly higher grain yield was recorded in early season with or without insecticide treatment while untreated plots in late season resulted in zero grain yield. The genotype IT98K-131-2 demonstrated superiority in grain yield over other genotypes in all the environments. Besides controlling insect pest infestation chemical treatment was found to enhance grain yield through increase in days to maturity and delayed pod filling duration.

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