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Effect of Herbicides, seed dressing chemicals and spray regimes on germination, insect infestation and yield of Cowpea (*Vigna unguiculata* (L) Walp)

***[1]Tekwa IJ, [2]Ijabula ST and [1] Maijama'aNP**

Dept. of Agricultural Technology, Federal Polytechnic, P.M.B 35, Mubi, Adamawa State, Nigeria
Dept. of Pest Management Technology, Samaru College of Agriculture, A.B.U Zaria, Kaduna State, Nigeria

**Corresponding author: johntekwa@gmail.com*

Abstract

A field experiment was conducted in Samaru-Zaria located between latitudes11^{0}10' and 10^{0}54'N and longitudes 07^{0}38' and 07^{0}44'E within the guinea Savanna zone of North central Nigeria. The effect of seed treatment chemicals (Apron Star® 24WP, 20% w/w Thiamethoxoams, 20% w/w Metalaxyl-M and 20% w/w Difeno-conazole) and four spray regimes (5 days, 7 days, 10 days and 14 days after sowing) on the germination, insect infestation and yield of cowpea (*Vigna unguiculata (L) Walp*) (SAMPEA-7) were investigated during the 2006/2007 rainy season. The experiment comprised of five treatments replicated four times in a randomized complete block design (RCBD). The result obtained showed that seeds dressed with Apron Star® recorded higher germination counts (35 seedlings) compared to the undressed seeds, which had the least estimates (26.75 seedlings) and lower yields (366.7kg/ha). The SAMPEA-7 seeds dressed and protected with Cypermethrin and Dimethoate for the control of field insect pests gave significant ($p<0.05$) grain yield per ha under 7 days (1387.50kg/ha) and 10 days (1208.30kg/ha) spray regimes. Farmers could therefore adopt either the 7 or 10 days spray regimes in the zone.

Key words: Cowpea yields; germination; insect infestation; seed dressing chemicals; spray regimes.

Introduction

Cowpea (*Vigna unguiculata* (L) Walp) is a leguminous crop, native of the drier regions. Jefferson (2005) and Davis et al (2005) confirmed that cowpea is an ancient crop that originated in central Ghana, Africa, being carbon dated to 1450-1400 BC (Flight, 1976). Cowpea was domesticated about the same time with pearl millet and sorghum some five to six thousand years ago (Davis et al, 1999). It is commonly referred to as southern pea, black eye pea, Crowder pea, lubia, niebe or frijole, marble pea or ponna. Cowpea is a primary source of plant protein; the grain, shelled/dried peas, leaf green pods and fresh shelled green peas are great sources of food and vegetables for human diets, as much as a fodder for farm animals. The percentage nutritional value of cowpea indicated its protein content to be 23%, fats 1.3%, 1.8% fibre, 67% carbohydrate and 8-9% water (Jefferson, 2005). Cowpea also serves as a cover crop important for soil nitrogen fixation. Davis et al (2005) recently reported that the improved dual purpose cowpea intercropped with sorghum or millet can fix between 25-45kg per hectare of nitrogen (N) capable of reducing the N fertilizer requirements for cereals by half. Cowpea is adoptable to hot weather, drought, less fertile soil conditions and widely cultivated across the globe (Fery, 2002). Despite its adoptability to stringent conditions, still insects pose a great threat to achieving its optimum yield. The crop usually suffers serious pest and disease infestation which constitute a major limitation to its production (Singh et al. 2000). Damage from pest such as beetles, leaf hoppers and birds could lead to poor plant stands (Singh et al, 1997). Field pest of cowpea appears to be the major constraints in both field and storage conditions (Singh et al, 1990). According to Raheja (1976) and Singh and Allen (1980), losses of cowpea grains due to pest infestation range from 20 to 100%, annually. Amatobi et al (2005) also opined that field insect pests could even cause colossal loss in yield of cowpea. The use of plant materials, synthetic chemicals and biological controls have been experimented by many researchers to control insects in cowpea production in recent years. Seed treatment with chemicals such as insecticide dusts

Table 1. Mean values of germination counts of SAMPEA-7 treated with Apron star (R) 42 w/s in Samaru, Zaria.

Spray regimes	Germination count
5-days	35[A*]
7-days	34.75[A]
10-days	34.75[A]
14-days	35.00[A]
Control	26.75[B]
SE±	1.197
CV %	7.19

*Means followed by the same letter(s) in a column are not significantly different at 5%.

Table 2. Mean pod count per plant (SAMPEA-7) at 10 WAS treated with insecticides at different spray intervals in 2006/2007 rainy season.

Spray regimes	Pod count per plant
5-days	26.50[A]
7-days	23.25[B]
10-days	24.75[AB]
14-days	22.00[B]
Control	19.00[C]
SE±	0.745
C.V (%)	6.88

* Means with the same letters in a column are not significantly different at 5%

or slurry are applied as toxic barriers on seeds or growing crops in order to provide protection against infestation by pathogenic organisms (Breniere, 1967). Getting a good crop stand is paramount to getting good yields. Other seed treatments were popular in the past; these include Fernasan-D® (25% Thiram, 20% Lindane) and Aldrex-T®, which are no longer recommendable. Current findings accounted dust formulation such as Apron star® (20% w/w Thiamethoxam, 20% w/w Metalaxyl-M and 20% w/w Difenoconazole) or Carbosulfan as quit effective seed dressing chemicals against insect pest infestations. Proper use of seed dressing ensures good initial plant stands, which are characteristic of successful farming (Singh et al 1997). The problem of insect pest infestation on cowpea continues to surface annually, there by affecting the quality and quantity of yields. In light of this problem, the present research intends to asses the effect of Apron star® spray regimes on insect infestation, germination and yield of cowpea in the study area.

Materials and methods

Field experiment was conducted in Samaru, Zaria ($11^0$10'N and $07^0$38'E) in the Northern guinea Savannah ecological zone of Nigeria during 2006/2007 rainy season, to evaluate the effect of Apron star® spray regimes on insect infestation, germination and yield of cowpea (SAMPEA-7). Soils of the study area are predominantly sandy loam textured. The experimental area (513 m^2) was sprayed with herbicides (Paraquat dichloride) as a pre-emergence at the rate of 2.5 litres active ingredient per hectare to control weeds using 25 litres of water per hectare. The land was tilled after one week of spraying and manually ridged at 0.75 m apart using a hoe. The experimental area was divided into five blocks separated by an alley of 1.5 m, and each block was divided into 20 plot sizes of 4 m x 3 m (12 m^2) spaced at 1 m in-between plots and blocks. The experiment was laid in a randomized complete block design (RCBD), replicated four times. The treatments were tagged as A, B, C, D and E, where A = 5 days spray regime, B = 7 days spray regime, C = 10 days spray regime, D = 14 days spray regime and E = no spray (untreated control). Treatment C (10 days spray regime) was considered to be the standard. SAMPEA-7 seeds sourced from Institute for Agricultural Research (IAR), Ahmadu Bello University (ABU), Zaria, was dressed with Apron star® 42 wp used for controlling soil pest, diseases and other insects that could feed on the germinating seed sown at 2-3 cm depth within intra raw spacing of 30cm and inter row spacing of 75cm apart. The cowpea seedlings were later thinned to two (2) plants per stand at two weeks after germination, totalling a plant population of 36 stands per plot. Weeding was done at 3 and 6 weeks after sowing (WAS). Fungicide (Benlate and Dithane M-45) was sprayed at 4 and 7 WAS, while the insecticide (Cypermethrin 10% EC) was applied at 9 and 10 WAS and stopped between 16 and 17 WAS when most of the pods were matured and turned brown ready for harvest. Harvesting of the SAMPEA-7 pods was manually conducted twice per plot. Pods were kept in a well labelled polythene bags, then threshed and weighed using Metler balance (P.E. 2000 model). Data collected were analysed using analysis of variances (ANOVA) and the means were compared using students Newman Keuls (SNK) test.

Results and discussion

Results on seedling germination counts taken at WAS is presented in Table 1. The results showed that the germination counts on treated plots were significantly different ($P<0.05$) from the untreated control, being the lowest (26.75). Highest mean value of germination count was recorded under 5 days spray regime (35.25), and was statistically comparable with the mean values of 7 days (34.75), 10-days (34.75) and 14-days (35.00) spray regimes (Table1). Poor germination counts of untreated seeds was probably due to infestation by fusarium specie, particularly Pythium and Colletotrichum species, which probably caused the rotting of the

Table 3. The mean yields (in kilogram weight) of both the threshed and un-threshed SAMPEA-7 pods

Spray regimes	Mean weights of unthreshed SAMPEA-7 pods (kg/ha)	Mean weights of threshed SAMPEA-7 grains (kg/ha)
5-days	1250.0^{AB}	895.80^{B}
7-days	1664.60^{A}	1387.50^{A}
10-days	1354.20^{AB}	1208.30^{AB}
14-days	1083.30^{BC}	989.60^{AB}
Control	718.70^{C}	366.70^{C}
SE±	129.776	106.951
CV (%)	21.38	22.06

* Means followed by the same letters in a column are not significant different at 5%.

seeds that could have been avoided, if treated with seed dressing chemicals (Chantereau and Nicov (1991). This view opined similarly with the reports of Singh et al (1997) and Allen and Singh (1999), that damages by beetles, leaf hoppers, bean-flies and birds could cause poor plant stands, when seeds are not treated with dressing chemicals. Results on pod counts per plant of SAMPEA-7 under the different spray regimes is presented in Table 2. The results showed that the mean pod count per plant for SAMPEA-7 under different spray regimes differ significantly (P<0.05) from the untreated control. The 5-days spray regime still had the highest (26.50) pod counts, relative to the observed germination establishment. The higher mean pod count under the 5-days spray regime (26.50) was also statistically comparable with 10-days spray regime (24.75). It was followed by 7-days spray regime with a pod count mean value of 23.25. The least mean pod count (19.00) was obtained on the control plots.SAMPEA-7 treated with cypermethrin and dimethoate insecticides had higher pod counts of 26.50 and 24.75 respectively, than on untreated control (19.00). The low pod count observed on the control plots could be attributed to the destructive impacts of insect pest infestation during the vegetative growth period (Singh et al, 1997). The mean yields (in kilogram weight) of both the threshed and un-threshed SAMPEA-7 pods is presented in Table 3. The results showed that the mean weights of the threshed pods showed a significant difference (P<0.05) between pods harvested on the treated and untreated (control) plots. The highest mean pod weight was recorded under 7-days spray regime (1664.60kg/ha), and was statistically comparable with the mean pod weights for 5-days (1250.00kg/ha) and 10-days (1354.20kg-/ha) spray regimes. However, the mean pod weights observed under 5-days spray interval, was statistically comparable with the 10-days and 14-days (1083.30kg/ha) spray intervals (Table 3). These differing weights could perhaps be due to variable treatment conditions. Raheja (1976) reported that control of insect pests on cowpea could foster higher yields and healthier cowpea pods. The mean weight of un-threshed SAMPEA-7 pods under untreated control (718.70kg/ha) ranked least and is significantly different (P<0.05) from all other treatments, indicative of instance of pest damage severity (Singh and Allen, 1980; Chantereau and Nicov, 1991). The mean grain yield of threshed SAMPEA-7 at the different spray regimes also differed significantly (P<0.05) between the treatments and the untreated control. The highest mean grain yield was recorded under 7-days spray regime (1387.50 kg/ha), and statistically similar with the yields for 10-days (1208.30 kg/ha) and 14-days (989.60kg/ha) spray regimes. The untreated control had the lowest yield (366.70 kg/ha) with a significant difference (P<0.05) from all the other treatments. The observed higher yield under the 7-days spray regime could be attributed to the phyto-toxicity of the insecticides administered at close intervals, which perhaps eliminated the insect pests. While the lower yield obtained under untreated control, explains the need for chemical treatments of field crops. This view agrees with the reports of Raheja (1976), that insecticides are essential for facilitating higher yields in cowpea production. Similar reports by Verma and Mishra (1989), confirmed that tiny and shrivelled pods are caused by non controlled insect pest which affects seed weights adversely.

Conclusion

SAMPEA-7 dressed with Apron star®, cypermethrin and dimethoate recorded better germination counts, less insect infestation and higher yields per hectare, suggestive of chemical control effectiveness on cowpea production (Singh et al, 1997). Increased yield of SAMPEA-7 pods and grains corresponded well to the treatments, especially under 7-days and 10-days spray regimes.

Recommendation

It suffices to append that SAMPEA-7 production could be profitable using correct protection with the applied chemicals. Considering the higher yields obtained under 7-days (1387.50kg/ha) and 10-days (1208.30kg/ha) spray regimes, farmers are therefore recommended to adopt either the 7 or 10-days spray regimes for optimum yields in the region.

References

Allen DJ, Singh RS (1999) Cowpea pest and diseases in Nigeria, 1st edn. IAR Ahmadu Bello University, Zaria, Nigeria

Amatobi AM, Dike MC, Opareke AM (2005) Integrated pest management of thrips and maruca on cowpea at Samaru. cropping scheme meeting. Report on legume and oil seed research programme. IAR Ahmadu Bello University, Zaria, Nigeria 5:23-24

Breniere J (1967) *Les problems entomologie duniebe et des graninee de grand culture*. Japon 110-113

Chantereau JM, Nicov A (1991) Principles of plant diseases. Longman Group, Hong Kong

Davis DW, Oelke EA, Oplinger ES, Doll JD, Hason CV, Putnam DH (1999) Agronomy and plant genetics of alternative plant and animal products. University of Wisconsin, Madison, USA

Davis DW, Oelke EA, Oplinger ES, Doll JD, Hason CV, Putnam DH (2005) Cowpea: Alternative field crop manual; Center for alternative plant and animal product. University of Wiscosin, Madison, USA

Fery FL (2002) New opportunities in Vigna. In: Janick J, Whipkey A (ed) Trends in new crops and new uses, ASHS Press, Alexandria

Flight C (1976) The Kintampo culture and its place in Africa. In: Harlon (ed) International Institute of Tropical Agriculture (IITA), End of year annual reports, Ibadan, Nigeria

Jefferson T (2005) Cowpea: A versatile crop for hot dry conditions. Thomas Jefferson

Agricultural Institute, West Nifong, Boulevard, Colombia

Raheja AK (1976) A ULV Spraying for Cowpea in Northern Nigeria. PANS: 222-37

Singh SR, Allen DJ (1980) Pests, disease resistance and protection in cowpea advances. In: Field RJ, Bunting H H (ed) Legume Science Summer, IAR Ahmadu Bello University, Zaria, Nigeria

Singh BB, Mohan-Raj DR, Dasheill KE, Jakai LE N (1990) Recent advances in cowpea breeding research. Centre for Agricultural Sceince, Ibadan Nigeria

Singh BB, Mohan-Raj DR, Dashiel KE, Jakai LE N (1997) Advances in cowpea research. IITA Ibadan, Nigeria in collaboration with Japan international research centre for agricultural science, Toukuba-Ibaraki, Japan

Singh BB, Asante K, Ajeibe H, Mohammed SG (2000) General guide for cowpea cultivation and seed production. Federal Ministry of Agriculture. Sasakawa, Nigeria

Verma SC, Mishra RK (1989) Influence of Stony thiram treated sorghum seeds on germination and seedling of cowpea. Afri J 314:114-117