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Effect of Mulvap 100% EC. (Dichlorvos) Spray Schedules on the Control of Insect Pests and Yield of Cowpea (*Vigna Unguiculata* L. Walp) in Enugu, Southeastern Nigeria

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Abstract**—** *A field experiment to evaluate the effect of mulvap100%Ec. (Dichlorvos) spray schedules on the control of insect pests, and yield of cowpea (Vigna unguiculata L. Walp) was carried out during the 2016 cropping season at the Faculty of Agriculture and Natural Resources Management Teaching and Research Farm of Enugu State University of Science and Technology Enugu, Southeastern Nigeria, using a randomized complete block design (RCBD) with four treatments replicated five times. There was a significant (P=0.05) effect of mulvap100%Ec. Spray schedules on all the parameters assessed. Mulvap100%Ec. Sprayed every 7 days performed significantly (P=0.05) better than any other insecticide spray schedule in the control of cowpea insect pests, in addition to producing significantly higher pod yield. This was followed by the insecticide sprayed every 14 days, every 21 days and no insecticide sprayed respectively. Plants sprayed with mulvap100%Ec. every 7 days recorded mean number of 0.00 aphids per plant, 2.69% leaf damage by leaf beetles, mean number of 0.64 flower thrips, 0.11 maruca larvae per plant, 0.35% dimpled and shriveled seeds and pod yield of 0.26 tonha^{-1} , followed by plants sprayed with the insecticide every 14 days that recorded mean number of 13.38 aphids per plant, 3.89% leaf damage by leaf beetles, mean number of 1.89 flower thrips per flower, mean number of 0.57 maruca larvae per flower, 1.89% dimpled and shriveled seeds, and pod yield of 0.13 tonha^{-1} and lastly plants sprayed with no insecticide that recorded mean number of 23.39 aphids per plant, 5.49% leaf damage by leaf beetles, mean number of 4.94 flower thrips per flower, mean number of 1.41 maruca larvae per flower, 3.81% dimpled and shriveled seeds, and pod yield of 0.11 tonha^{-1} .*

Keywords**— Cowpea (Vigna unguiculata), insecticide, spray schedules, cowpea insect pests.**

I. INTRODUCTION

Cowpea (*Vigna unguiculata* L. Walp) is one of the most widely used legumes in the tropical world. The grain is used extensively for human nutrition. It is a major vegetable source of protein for human consumption especially in Africa (Ileke *et al*. 2013). Cowpea is a staple component of the diet in several developing countries and a major source of protein to combat malnutrition in young children in Lieu of expensive animal protein. Cowpea seed contains about 25% protein, making it extremely valuable in areas where many people cannot afford proteinous foods such as meat and fish (Lephale *et al*. 2001). It has been regarded as poor man's meat (Ileke *et al*. 2012). It is an extremely important protein source to Vegetarians and people who cannot afford animal protein (Adeyemi *et al*. 2012). Cowpea seeds are also a rich source of minerals and vitamins (Hall *et al.* 2003). The green and dry haulm are fed to livestock particularly in dry seasons when animal feed is scarce (Ababe *et al.* 2005) and also as source of income when sold to farmers who use them as livestock feed (Dugje *et al.* 2009). Cowpea is a warm weather crop that is well adapted to drier regions of the tropic like Nigeria where other food legumes do not thrive well. (Abate *et al.* 2011). Nigeria is its Largest producer and consumer, accounting for about 45 percent of its world's production (Lowenberg-Deboer and Ibro 2008), Ndong *et al.* 2012) while Africa accounts for 75%.

However, the production and the storage of this important crop have faced so many constraints. Okelede and Ariyo (2000) stated that the production of this crop in Nigeria is low and has not matched the demand of the consumers. They also noted that the shortfall in cowpea production is traceable to problem of poor yield resulting from multifarious insect pests and diseases affecting the crop at different stages of development as well as continuous use of low yielding varieties.

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Traditional farmers apply little or no insecticide on cowpea and consequently obtain low yield. Variations among environments for cowpea grain yield where greater when no insecticide was applied than where it was not used (Blade *et al.* 1992). Field insect pests can even cause colossal loss in yield of cowpea (Amatobi *et al.* 2005). They also noted that without the control of insect pests of cowpea, reasonable grain yield cannot be obtained. Several control measures are available but chemicals are more effective, giving several fold increase in grain yield. However, most small scale farmers do not adequately control insect pests and diseases because of the high cost of chemicals and labour (Opole *et al.* 2005). Many entomologists have made efforts to identify the safe and effective chemicals and also optimum number of spray for controlling the most important pests of cowpea, particularly those affecting flowers and pods (Adejumo, 2005, Opole *et al.* 2005). Therefore the general objective of this research work was to evaluate the effect of mulvap100%Ec. on the control of insect pests and yield of cowpea in Enugu, southeastern Nigeria.

II. MATERIALS AND METHODS

A field experiment to evaluate the effect of mulvap 100%Ec. spray schedules on the control of insect pests, and yield of cowpea was carried out during the 2016 cropping season at the Faculty of Agriculture and Natural Resources Management Teaching and Research Farm of Enugu State University of Science and Technology Enugu, Southeastern Nigeria.

Experimental Design.

The experiment was carried out using a randomized complete block design (RCBD) with four treatments replicated five times. The experimental area measured 14 × 11 m (154 m^2). The experimental units (plots) measured 2 m×2 m (4m^2) and were separated by 1m pathway. Three seeds were sown per hole at a spacing of 50 cm × 50 cm and later thinned down to two plants per hole at 7 days after germination.

Treatment. 1.5 liter/ha of mulvap100%Ec. at four spraying schedules viz; 0 liter/ha sprayed, 1.5 liter/ha sprayed every 7 days till harvest, 1.5 liters/ha sprayed every 14 days till harvest, 1.5 liters /ha sprayed every 21 days till harvest.

Data Collection.

Data were collected on;

- The number of cowpea aphids (*Aphis craccivora*) per plant, a total of 10 plants were sampled per experimental units. A plastic bowel was half filled with water and aphids found on each plant were dislodged into the bowel. The water that contained the aphids was filtered with a sieve of 0.15 mm or 150 micro mesh size and the aphids counted.
- Percentage leaf damage by leaf beetles (*Ootheca mutabilis* and *Luperodes lineata*).
- The number of flower thrips per flower. This was done by removal of 10 flowers every 2 days for 3 consecutive times starting from 7 days after flower initiation and counting the number of flower thrips in them.
- Number of *maruca*_larvae per flower. The same 10 flowers used for flower thrips count were used for this purpose.
- Percentage seed damage by pod sucking bugs were determined by calculating the percentage wrinkled and dimpled seeds at harvest.

Statistical Analysis.

The data collected were analyzed using the genstat release (2012) and analysis of variance outlined by Obi 2001.

III. RESULTS

Effect of Mulvap100%Ec.(Dichlorvos) spray schedules on the number of aphids per plants, percentage leaf damage by leaf beetles and number of flower thrips per flower.

The result of the experiment showed a significant (P=0.05) insecticide spray schedules on the mean number of aphids per plant, percentage leaf damage by leaf beetles and mean number of flower thrips per flower. Plants sprayed with the insecticide every 7 days has no aphids per plant indicating a hundred percent (100%) aphid control which also differed significantly from the rest of the spray schedules. Plants sprayed every 14 days had a mean number of 13.38 aphids per plant which differed significantly (P=0.05) from plants sprayed every 21 days and those sprayed with no insecticide that recorded mean number of 20.08 and 23.39 aphids per plant respectively. However, plants sprayed with insecticide every 21 days recorded mean number of aphids that did not significantly differ from those sprayed with no insecticide (Table 1).

On the mean percentage leaf damage by the leaf beetles, there was a significant (P=0.05) insecticide spray schedules effect with plants sprayed every 7 days recording the least mean percentage of 2.69 damaged leaves by leaf beetles, followed by plants sprayed every 14 days having a mean number of 3.89% damaged leaves and lastly plants sprayed with no insecticide with a mean of 5.49% damaged leaves by leaf beetles, which did not significantly differ from plants sprayed every 21 days that recorded a mean of 4.08% damaged leaves (Table 1). There was also a significant (P=0.05) insecticide spray schedules effect on the mean number of flower thrips per flower. Plants sprayed with insecticide every 7 days recorded the least mean number of 0.64 flower thrips per flower that differed significantly (P=0.05) from the rest of the spray schedule, followed by plants sprayed every 14

days that had a mean of 1.87 flower thrips per flower and lastly, plants sprayed with no insecticide having a mean of 4.49 flower thrips per flower (Table 1).

Table.1: Effect of Mulvap100%Ec.(Dichlorvos) spray schedules on the mean number of aphids per plants, percentage leaf damage by leaf beetles and mean number of flower thrips per flower.

Spray schedules (days)	mean number of Aphids per plants	mean percentage leaf damage by leaf beetles	mean number of flower thrips per flower
0	23.39	5.49	4.94
7	0.00	2.69	0.64
14	13.38	3.89	1.87
21	20.08	4.08	2.67
F-LSD $_{0.05}$	4.25	0.99	1.06

Effect of Mulvap100%Ec.(Dichlorvos) spray schedules on the number of *Maruca* larvae per flower, percentage dimpled and shriveled seeds caused by pod sucking bugs and pod yield (tonha^{-1}).

The result of the experiment showed a significant (P=0.05) effect on the mean number of *Maruca* larvae per flower with plants sprayed every 7 days recording the least mean number of 0.11 *Maruca* larvae per flower, followed by plants sprayed with the insecticide every 14 days having a mean number of 0.57 *Maruca* larvae per flower and lastly plants sprayed with no insecticide that had a greater mean number of 1.41 *Maruca* larvae per plant which differed significantly from plants sprayed every 21 days that had a mean number of 0.66. *Maruca* larvae per plant. Again, there was a significant (P=0.05) effect of Mulvap100%Ec. spray schedules on the mean percentage dimpled and shriveled seeds caused by pod sucking bugs with plants sprayed every 7 days recording the least mean percentage of 0.35 dimpled and shriveled seeds, followed by plants sprayed with the insecticide every 14 days that recorded a mean percentage of 1. 89 dimpled and shriveled seeds which differed significantly from the rest of the insecticide spray schedules. Furthermore, there was a significant (P=0.05) effect of mulvap100%Ec. spray schedules on pod yield with plants sprayed every 7 days recording the highest mean pod yield of 0.26tonha^{-1}, followed by plants sprayed every 14 days having a mean pod yield of 0.13tonha^{-1} and lastly plants sprayed with no insecticide recording 0.11tonha^{-1} that did not differ significantly (P=0.05) from the rest insecticide spray schedules, except that of every 7 days spray schedule (Table 2).

Table.2: Effect of Mulvap100%Ec.(Dichlorvos) spray schedules on the number of Maruca larvae per flower, percentage dimpled and shriveled seeds caused by pod sucking bugs, and pod yield(tonha^{-1}).

Spray schedules (days)	mean numbers of *Maruca* larvae/plant	mean number of dimpled and shriveled seed (%)	pod yield (tonha^{-1})
0	1.14	3.81	0.11
7	0.11	0.35	0.21
14	0.57	1.89	0.13
21	0.66	1.96	0.12
F-LSD $_{0.05}$	0.36	1.38	0.12

IV. DISCUSSION AND RECOMMENDATION

A hundred percent (100%) control of aphids by Mulvap100%Ec. (Dichlorvos) sprayed every 7 days showed that a regular application of this insecticide to cowpea plants is necessary for a total eradication of this cowpea insect pest. Apart from total eradication of aphids on this important leguminous crop, this insecticide sprayed every 7 days on cowpea plants that recorded lower levels of leaf beetles, flower thrips, *Maruca* larvae and pod sucking bugs infestation, also emphasized the importance of regular application of this insecticide.

Furthermore, Mulvap100%Ec.(Dichlorvos) sprayed every 7 days on cowpea plants recording a significant (P=0.05) higher mean pod yield of 2.26tonha^{-1} also showed the importance of regular application of insecticide to improve pod yield in cowpea. These findings agreed with the following researchers; Alabi *et al. (*2003) indicated that low yield is not inherent in cowpea but mainly caused by insect pests attack. They also noted that controlling flowering and podding pests resulted in highest grain yield per plot. He however recommended applying insecticide once weekly during flowering and podding stage than applying it once every week through the cowpea growing period. A similar result was reported by (Algali 1992), which suggested that insect pests of flowers and pods were most important in reducing grain

yield. Karugi *et al.* (2000) reported that regular application of insecticide generally reduce cowpea insect pests infestation and markedly increase yield. Isubikalu, (2002). Omongo *et al*. 1998 indicated that in some parts of Nigeria like the North, large scale cowpea producers, sometimes apply insecticides as many as 8-10 times during the growing season to control insect pests. They also suggested that 10 days interval insecticide application (4 times) can be as profitable as 7 days interval application (5 times) in cowpea production. Again, (Emosairue *et al.* 2004), observed that insecticide at present offer the only effective control of pests and a crop sprayed weekly from the first day after planting (DAP) can out yield an unsprayed crop by eight to nine times (784kg/ha), and less frequent application (every two weeks) gave intermediate yield of 452kg/ha, if started 21 DAP, 243kg/ha and if started 35 DAP, 187kg/ha.

As a result of this experiment, I suggest that cowpea producers in Enugu area, southeastern Nigeria should practice spraying of insecticide to growing cowpea plants weekly starting from one week after germination for the purpose of controlling cowpea insect pests attack and maximizing pod/grain yield. This is so because, this insecticide spraying interval is close enough to meet flowering and podding stages which were observed by some researchers as the critical stages of cowpea growth at which insecticide application significantly (P=0.05) minimizes pod/grain yield loss due to insect pests (Alabi *et al.* 2003).

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