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COMPATIBILITY OF INSECTICIDES WITH FOLIAR NUTRIENTS IN CHICKPEA

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ABSTRACT

The present investigation carried out on field of Pulses Research Unit, Dr. PDKV Akola in Rabi season of 2020. Mix prescribed doses of Urea 2%, DAP 2% and KNO₃ 2% in recommended insecticides with tank mix formulation. Apply the mixture at flowering and pod formation stage. Observe compatibility of spray mixture, larval count before and after spray and per cent pod damage at harvest with extrapolation of yield (Kg/ha). Observe injury to the leave. The insecticide treatment Emamectin Benzoate 5SG, Chlorantraniliprole 18.5 Sc in combination with DAP 2% and KNO₃ 2% found best treatments in terms of larval reduction at 50% flowering stage and pod filling stage. While, best treatment in terms yield was Chlorantraniliprole 18.5SC with DAP 2% recorded a yield 1753 KG/ha. The next better treatment was Chlorantraniliprole 18.5 Sc in combination with KNO₃ 2% (1690KG/ha).

Key words: Compatibility of insecticides, foliar nutrients, chickpea

Introduction

Tank mixing is the preparation of agrochemicals and similar products in the tank or containers shortly before application. The progressive increase in global population makes it necessary to increase food production. Thus, it is required to introduce the technologies that solve or minimize problems such as pests, diseases nutrient deficiency, competition between plants and water scarcity (Albuquerque *et al.*, 2016). Agro chemicals use in cultivated area has high operational costs and, therefore, combined applications of different products in most crops. Approximately 97% of agrochemical users mix up to six or more products, applying them concomitantly. The surfactant is typical in these mixtures, and these products can cause synergistic effects in pest control (Li *et al.*, 2019)

Material and Methods

The present investigation carried out on field of Pulses Research Unit, Dr. PDKV Akola in Rabi season of 2020. In compatibility studies, insecticides were involved namely chlorantraniliprole 18.5 and Emamectin Benzoate 5Sg and

untreated control (Factor A). Three Foliar nutrient treatments were chosen 2% KNO₃, 2% DAP, 2% Urea and untreated control. The FRBD design applied with standard crop raising procedure. Apply the mixture at flowering and pod formation stage. Observe compatibility of spray mixture, larval count before and after spray and per cent pod damage at harvest with extrapolation of yield (Kg/ha). Observe injury to the leave.

Results and Discussion

Effect of Foliar Nutrients with Insecticides on *H. Armigera* on Chickpea on After Flowering, Pod Filling Spray, Pod Damage and Yield

The compatibility of insecticides with foliar nutrients studied on chickpea against gram pod borer *H. armigera* Data given in Table 1 reveals, that the insecticides treatment found significant effect on *Helicoverpa armigera* after spraying at 50 per cent flowering, chlorantraniliprole 18.5 and Emamectin Benzoate 5Sg found at par with each other and recorded 0.0, 0.0 larvae/plant, respectively. While control recorded highest

Table 1: Effect of foliar nutrients with insecticides on *H.armigera* on chickpea on after flowering, pod filling spray, pod damage and yield.

Treatment	Spray at 50% flowering		Spray at pod filling		% Pod Damage	Yield Kg/ha
	Before Spray	After spray	Before Spray	After spray		
Insecticide(Factor A)						
(A1)Chlorantriliprole 18.5 SC	6.75	0.0(0.71)	2.65	0.0(0.71)	3.78	1596
(A2)Emamectin benzoate	7.58	0.0(0.71)	2.74	0.0(0.71)	3.37	1588
(A0)Control	6.50	6.33(2.60)	2.16	2.42(1.69)	5.46	1269
S.E.(m)	0.38	0.04	0.25	0.03	0.13	26.41
C.D.@5%	1.12	0.12	0.73	0.08	0.39	77.47
Foliar Nutrients(Factor B)						
(B1) KNO ₃ 2%	6.78	2.56(1.42)	2.48	0.78(1.03)	3.76	1371
(B2) DAP 2%	6.67	1.67(1.25)	2.56	0.78(1.03)	4.12	1554
(B3) Urea 2%	7.22	1.78(1.27)	2.22	0.44(0.92)	3.87	1586
(B4) Without Nutrient	7.11	2.44(1.40)	2.81	1.22(1.15)	5.04	1428
S.E.(m)	0.44	0.05	0.29	0.03	0.15	31
C.D.@5%	1.30	0.14	0.84	0.09	0.45	90
Interaction(AXB)						
S.E.(m)	0.76	0.08	0.50	0.06	0.26	52
C.D.@5%	2.24	0.24	1.46	0.18	0.77	154
C.V.(%)	N.S.	10.63	N.S.	9.93	10.8	6.16
F Test	NS	sig	NS	sig	Sig	Sig

(Fig. in paranthesis are square root (x +0.5) transformed values)

population of 6.33 larvae/5plant. Factor (B) found significant effect over *H. armigera* population due to various treatments of foliar nutrients viz. treatment without foliar nutrient spray, KNO₃ 2%, DAP 2% and Urea 2% foliar nutrient found significant effect of foliar nutrients at the time of 50 per cent flowering recorded a population of *H. armigera* was 2.56, 1.67, 1.78 and 2.44 larva/5 plant respectively. Application of spray at pod filling stage found significant effect of insecticide application over *Helicoverpa armigera* larval population i.e. chlorantriliprole 18.5 SC and Emamectin Benzoate 5SG found at par with each other and recorded 0.00, 0.00 larva/5 plant. While control recorded highest population of 0.42 larva/ 5 Plant. Factor B found significant effect over *H. armigera* population due to various treatments of foliar nutrients and results obtained were 0.78, 0.78, 0.44 and 1.42 per cent respectively in treatment of KNO₃ 2%, DAP 2%, Urea 2% found at par with each other at pod filling spray.

Per cent pod damage recorded at the time of harvest found significant effect of insecticides chlorantriliprole 18.5 SC (3.78 per cent) and Emamectin benzoate 5 SG (3.37per cent), In respect of higher per cent pod damage recorded in untreated plot i.e. 5.46 larva/5 plant. While factor B found significant effect of foliar nutrients found in respect of per cent pod damage observed due to *H. armigera*. The treatment of Urea 2%, DAP 2%, KNO₃ 2% recorded per cent pod damage 3.76, 4.12, 3.87 per

cent damage, found at par with each other. While the higher per cent pod damage recorded in treatment without foliar nutrient 5.04 per cent pod damage.

Interaction effect on yield (Kg/ha) calculated in treatment of insecticides and foliar nutrients (given in Table 5) found significant effect recorded a population of 1596, 1588 Kg/ha was superior and found at par with each other in treatment of Emamectin Benzoate 5SG and chlorantriliprole 18.5 sc. While lowest yield 1269 Kg/ha recorded in untreated plot (Control). While Factor B found significant effect of foliar nutrients over yield recorded 1371, 1554,1586 Kg/ha. Without foliar nutrient treatment recorded 1428 kg/ha.

Table 2: Interaction effect for *H.armigera* population at flowering spray as influenced by interaction effect of insecticide and foliar nutrients.

Treatment	Without foliar Nutrients	KNO ₃ 2%	DAP 2%	Urea 2%
(A1) Chlorantriliprole 18.5 SC	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)
(A2) Emamectin benzoate 5 SG	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)
(A0) Control	7.67 (2.86)	5.00 (2.34)	5.33 (2.4)	7.33 (2.79)
SE(m)	0.08			
CD @ 5%	0.24			
CV	10.63			

Interaction Effect for Flowering Spray as Influenced by The Interaction Effect of Insecticide and Foliar Nutrients

Interaction effect of insecticides with foliar nutrients studied in chickpea against gram pod borer *H. armigera* Data given in Table 2 reveals that the insecticides treatment found significant interaction effect over *Helicoverpa armigera* after spraying at 50 per cent flowering, All treatment combination with choranthrinilliprole 18.5 sc and E. benzoate 5Sg and nutrients viz. Urea 2%, DAP 2%, KNO₃ 2% recorded nil larval population. While treatment without foliar nutrients recorded a larval population (7.67 larva/5 plant), treatment combination without insecticide+ Urea 2% recorded 7.33 larva/5plant followed by treatment combination without insecticide+DAP 2% recorded 5.33 larva/5plant followed by treatment were combination without insecticide+ KNO₃ 2% (5.00 larva/5 plant). The highest population recorded in treatment of treatment without foliar nutrient+ without insecticide (Control).

Similar results were obtained by Albuquerque *et al.*, 2016, who observed fertilizer mixed in tank showed best interaction of pesticides Vs fertilizers were analyzed and classified as being either additive or synergistic effect.

Interaction Effect on *H. Armigera* Population at Pod Filling Spray as Influenced by Interaction Effect of Insecticide And Foliar Nutrients.

Interaction effect of insecticides with foliar nutrients studied in chickpea against gram pod borer *H. armigera* Data given in Table 3 reveals, that the insecticides treatment found significant interaction effect over *Helicoverpa armigera* population on spraying at pod filling stage, All treatment combination with chloranthrinilliprole 18.5 SC and Emamectinbenzoate 5Sg and nutrients viz. Urea 2%, DAP 2%, KNO₃ 2% recorded nil larval population. While treatment

Table 3: Interaction effect on *H. armigera* at pod filling spray as influenced by interaction effect of insecticide and foliar nutrients.

Treatment	Without foliar Nutrients	KNO3 2%	DAP 2%	Urea 2%
(A1) Chlorantrin-iliprole 18.5 SC	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)
(A2) Emamectin benzoate 5 SG	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)
(A0) Control	2.33 (1.68)	2.33 (1.68)	1.33 (1.34)	3.67 (2.04)
SE(m)	0.06			
CD @ 5%	0.17			
CV	9.93			

Table 4: Interaction effect of insecticide and foliar nutrients on pod damage of chickpea.

Treatment	Without foliar Nutrients	KNO3 2%	DAP 2%	Urea 2%
(A1) Chlorantrin-iliprole 18.5 SC	3.13	4.27	3.90	3.80
(A2) Emamectin benzoate 5 SG	3.13	3.20	3.00	4.13
(A0) Control	5.03	4.90	4.70	7.20
SE(m)	0.26			
CD @ 5%	0.77			
CV	10.88			

combination without insecticide + Urea 2% recorded 3.67 larva/5plant followed by treatment combination without insecticide+ KNO₃ 2% recorded 2.33 larva/5plant followed by treatment were combination without insecticide + without foliar nutrients recorded a larval population (2.33larva/5plant). The lowest population recorded in treatment of DAP 2% + without insecticide recorded 1.33 larva/5 plant, respectively.

Interaction Effect of Insecticides and Foliar Nutrients on Pod Damage And Yield.

Data given in Table 4 reveals that the interaction effect of insecticides treatment with foliar nutrients found significant effect overper cent pod damage. The lowest per cent pod damage recorded in treatment of Emamectin Benzoate 5 Sg +DAP 2% was 3.00 per cent which is at par with chlorantriniliprole 18.5 SC +without nutrient (3.13 per cent), chlorantriniliprole 18.5 SC +without nutrient (3.13 per cent), and treatment followed by were Emamectin Benzoate 5 Sg +KNO₃ 2% (3.20 per cent) and Emamectin Benzoate 5 Sg +Urea 2% (3.8 per cent), respectively. The next treatment found better in respect of per cent pod damage, Emamectin Benzoate 5 Sg +DAP 2% (3.9 per cent) and Emamectin Benzoate 5 Sg +Urea 2% (4.13 per cent). The next better treatment

Table 5: Interaction effect of insecticide and foliar nutrients on Yield (Kg/ha) of Chickpea.

Treatment	Without foliar Nutrients	KNO3 2%	DAP 2%	Urea 2%
(A1) Chlorantrin-iliprole 18.5 SC	1350	1690	1753	1593
(A2) Emamectin benzoate 5 SG	1526	1670	1583	1573
(A0) Control	1236	1303	1420	1116
SE(m)	52.83			
CD @ 5%	154.95			
CV	6.16			

found were Chlorantriliprole 18.5 SC +KNO₃ 2% (4.27 per cent), without insecticide + without foliar nutrients (Control recorded 4.70 per cent), without insecticide + KNO₃ 2% (4.9 per cent), without insecticide +Urea 2% (7.2 per cent), respectively.

These finding corroborate with the finding of Bal *et al.*, (2016), they observed several plant nutrients have effect on growth and development of plants amongst nitrogen is essential for tissue maintenance and reproduction and energy which can obtain by feeding on plants. While potassium provides high resistance against pests. High level of potassium enhances secondary compound metabolism, reduce carbohydrates accumulation and plant damage insect pest. Phosphorus also decrease the host suitability to insect pest.

Data given in Table 5 indicates that, interaction effect of insecticides treatment with foliar nutrients found significant effect overyield. The highest yield recorded in treatment of chlorantriliprole 18.5 SC + DAP 2% (1753 Kg/ha), Chlorantriliprole 18.5 SC +KNO₃ 2% (1690 Kg/ha) Emamectin Benzoate 5 Sg +KNO₃ 2% (1670 Kg/ha) which is at par with other and found best in respect of yield. The next treatment followed by was chlorantriliprole 18.5 SC +Urea 2% (1593 Kg/ha) and Emamectin Benzoate 5 Sg +Urea 2% (1573 Kg/ha) and Emamectin Benzoate 5 Sg + without nutrients (1526 Kg/ha), Emamectin Benzoate 5 Sg +foliar nutrients (1526 kg/ha), without insecticide +DAP 2% (1420 kg/ha),

chlorantriliprole 18.5SC + without nutrients (1350 Kg/ha), respectively. The next other treatments followed by were without insecticides +KNO₃ 2% (1303 Kg/ha), without insecticides +Urea 2% (1116 Kg/ha), respectively.

Conclusion

Interaction effect of insecticide E.benzoate mixed with foliar nutrients KNO₃ (3.20%) and DAP (3.00%) recorded least per cent pod damage at the time harvest. While same trend observed in yield that interaction effect of Chlorantriliprole 18.5sc sprayed with foliar nutrient DAP2% recorded highest yield 1753 KG/ha. The next better treatment in terms of yield was Chlorantriliprole 18.5 sc sprayed with foliar nutrient KNO₃ 2% (1690kg/ha). None of the insecticide with foliar nutrient combination recorded phytotoxicity.

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