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RESEARCH ARTICLE

Screening of cowpea genotypes for field infestation of bruchids and their control in storage

■ B.H. SUNITHA, K.P. VISWANATHA, B.C. CHANNAKESHAVA, J. DEVENDRAPPA, L.N. YOGESH AND H.B. DINESH

SUMMARY

An experiment was conducted to study the impact of different cowpea genotypes, insecticides and their interaction effect on field infestation of bruchids which acts as a primary source of storage loss. Twenty one genotypes of cowpea with three replications were subjected to pre harvest spray of Quinolphos 25 EC @ 0.05 per cent and malathion 50 EC @ 0.05 per cent and one with untreated control. The harvested seeds were stored for two months and observations were recorded on bruchids population, per cent damaged seeds and per cent weight loss in seeds at monthly intervals. It was observed that Quinolphos 25 EC @ 0.05 per cent pre harvest spray was effective in maintaining minimum or zero development of bruchid population, per cent seed damage and per cent weight loss of seeds in selective genotypes such as PGCP-3, KBC-2, DCP-17, TPTC-l, TPTC-2, PCP-9711.

Key Words : Cowpea, Genotypes, Field infestation, Bruchids

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Cowpea [*Vigna unguiculata* (L). Walp] is one of the most versatile food legumes in the tropical and sub-tropical regions of the world. It enjoys a place of importance both as pulse and a vegetable crop with a good source of protein (24 %), carbohydrate (60 %) and fat (2 %) and also a good source of vitamins and phosphorous. By virtue of its nutritional composition, its offers a great scope in meeting the nutritional requirement of weaker section of population. Being nitrogen fixing legume, its important role as green manuring crop can be judged by the fact that it can fix up to 240kg nitrogen per hectare besides leaving 60-70kg for succeeding crop. However, it suffers both qualitative as well quantitative losses due to attack of storage pests. More than 150 species of insect pests are known to attack pulse crops both in the field and in storage conditions. In India 25 species of these, are known to cause appreciable damage. Among these insect pests, bruchids [*Callosobruchus chinensis* (L.)] assume greater importance as they damage the final produce in the field as well as in the store. The genus *Callosobruchus* is very prominent in its incidence and includes a number of economically important species that attack stored pulses throughout the world. The field infestation of pulses by these pulse beetles acts as a potential source of initiation of population build up during post harvest period in stores. Hence an attempt has been made to evaluate the effectiveness of insecticides in preventing field infestation and development of pre harvest insecticidal treatment on control of bruchids during storage.

MEMBERS OF THE RESEARCH FORUM

B.H. SUNITHA, Department of Seed Science and Technology, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

Address of the Co-authors:
B.C. CHANNAKESHAVA, Department of Seed Science and Technology, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

K.P. VISWANATHA, J. DEVENDRAPPA, L.N.YOGESH AND H.B. DINESH, Department of Genetics and Plant Breeding, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

MATERIALS AND METHODS

The experiment comprised of 21 genotypes replicated three times and two insecticides (Quinolphos-Ekalux-25EC and Malathion-Cythion-50 EC) was sprayed individually at the time of harvesting to the replicated genotypes and one replication was maintained as control *i.e.*, without spray. Three hundred grams of seeds of these treated genotypes harvested were stored separately in plastic boxes and covered with muslin cloth for two months. Observations were recorded on number of bruchids emerged, number of damaged seeds (per cent seed damage or seed infestation) and seed weight loss at monthly interval by drawing 100 seeds randomly from the box.

RESULTS AND DISCUSSION

The results on impact of different genotypes, insecticides and their interaction effect on field infestation of bruchids population are indicated in Table l. It was observed that Quinolphos 25 EC @ 0.05 per cent pre harvest spray was effective in maintaining minimum or zero development of bruchids population in genotypes GC-3, TPTC-l,TPTC-2, PGCP-3, PCP-97197, PCP-9711, DCP-17 and KBC-2. Whereas more bruchids population was recorded in malathion 50 EC of 14.0,13.0 and 12.0 bruchids per 100 seeds in genotypes Co Vu-702, HC-98-64 and PGCP-5, respectively and increased to 40.0, 54.5 and 36.0 bruchids per 100 seeds respectively at the end of second month after storage. The genotypes which were evaluated for their susceptibility, the insecticides treatment harboured lower population of bruchids compared to control.

In some cases the increase or decrease in bruchids population, infestation and losses might be due to the effect of insecticide at later stage or second month after storage. The escape mechanism shown by the bruchids under field conditions, increasing in metabolic activities such as increase in the excretion, storage of toxicants in fat bodies (non sensitive organ), increase in levels of detoxifying enzymes esterases etc. The population of bruchids increased at second month after storage can also be due to storage environmental

Table 1: Effect of pre harvest insecticidal application on bruchids populations during storage of cowpea genotypes

Sr.No.	Genotypes	1 MAS			I	2 MAS	
		Malathion	Quinolphos	Control	Malathion	Quinolphos	control
1 .	Rc·lOI	2.0(1.58)	3.5(1.96)	4.5(2.21)	14.5(3.82)	7.0(2.71)	7.0(2.73)
2 .	GC-3	7.0(2.73)	2.5(1.72)	5.0(2.33)	13.5(3.73)	0.0(0.70)	19.0(4.41)
3 .	CoVu-702	14.0(3.77)	2.5(1.67)	16.0(4.06)	40.0(6.34)	24.0(4.94)	17.0(4.18)
4 .	GC-Oll	3.5(1.96)	3.0(1.87)	17.0(4.18)	9.0(3.04)	18.0(4.29)	32.0(5.66)
5 .	GC-OI2	1.0(1.22)	2.0(1.58)	4.0(2.06)	2.5(1.72)	24.0(4.94)	13.0(3.67)
6 .	GC-0203	0.0(0.7)	17.0(4.17)	20.0(4.52)	7.5(2.82)	23.0(4.83)	49.5(7.07)
7 .	CAZC-3	6.0(2.54)	15.0(3.93)	15.5(3.99)	3.5(1.99)	45.5(6.78)	71.0(8.44)
8 .	HC-98-64	13.0(3.67)	6.0(2.47)	49.5(7.07)	54.5(7.36)	4.5(2.21)	78.5(8.88)
9 .	TPTC-l	6.0(2.54)	5.5(2.39)	8.0(2.91)	9.5(3.16)	0.0(0.70)	88.0(9.40)
10.	TPTC-2	4.5(2.21)	1.0(1.14)	14.5(3.86)	24.5(4.85)	0.0(0.70)	26.0(5.14)
11.	TC-601	5.0(2.33)	9.0(3.07)	4.0(2.06)	10.5(3.30)	20.0(4.52)	6.5(2.64)
12.	PGCP-3	4.0(2.10)	0.0(0.70)	3.0(1.85)	5.0(2.33)	0.0(0.70)	1.85(4.35)
13.	PGCP-5	12.0(3.53)	6.0(2.47)	12.5(3.60)	36.0(6.03)	33.5(5.82)	27.5(5.28)
14.	PCP-9711	2.0(1.54)	5.5(2.23)	3.0(1.78)	12.0(3.52)	0.0(0.70)	13.0(3.65)
15.	PCP-97197	9.0(3.07)	0.0(0.70)	8.0(2.91)	33.0(5.78)	0.0(0.70)	15.5(3.93)
16.	KM-5	3.0(1.78)	2.5(1.67)	2.0(1.54)	5.50(2.44)	5.5(2.44)	9.0(3.07)
17.	DCS-7	9.0(3.07)	10.5(3.30)	6.0(2.54)	27.0(5.24)	27.5(5.28)	20.5(4.58)
18.	DCP-15	5.0(2.30)	2.5(1.72)	3.0(1.87)	30.0(5.51)	21.5(4.68)	16.0(4.06)
19.	DCP-17	2.5(1.72)	2.0(1.41)	28.0(5.33)	6.5(2.64)	0.0(0.70)	42.0(6.51)
20.	KBC-2	3.5(1.96)	0.5(0.96)	6.0(2.47)	10.5(3.30)	0.0(0.70)	17.0(4.18)
21.	TVX-944	2.0(1.54)	0.0(0.70)	8.0(2.91)	11.0(3.37)	3.5(1.72)	14.5(3.87)
	Mean	5.43	4.60	11.31	16.26	11.12	27.83
		S.E.±		C.D. (P=0.05)		S.E.±	C.D. (P=0.05)
Genotypes		0.192		0.72		0.191	0.71
Chemicals		0.072		0.27		0.07	0.27
AXB		0.33		1.24		0.33	1.24

MAS - Months after storage , Figures in parenthesis indicates square root transformed values for which statistical analysis was done conditions.

As a consequence of infestation development in the field, the seed damage (infestation) by the pulse beetle as presented in Table 2 reveals that minimum and zero per cent seed damage was observed in genotypes TPTC-l, TPTC-2, PGCP-3,PCP-9711, PCP-97197, DCP-17 and KBC-2 in Quinolphos 25 EC @0.05 per cent pre harvest treatment. In malathion 50 EC treatment only genotype GC-0203 had recorded zero seed damage which increased to 18 per cent at the second month after storage. At the end of storage 100 per cent seed damage was observed in genotypes GC-Ol1, CAZC-3, HC-98-64, TPTC-l and DCP-17. Similar results were also reported by Kulkarni in his study on field bean (1990), Padmavathi *et al.* on fodder cowpea (1999), Shashi Bhalla *et al.* on cowpea (2002), Jha on chick pea (2002).

The seed weight loss of different genotypes during the storage due to damage level in the seeds depected in the table reveals that Quinolphos 25 EC was effective in maintaining zero per cent seed weight loss in genotypes TPTC-l, TPTC-2, PGCP-3, PCP-9711, PCP- 97197, DCP-17 and KBC-2. Where as in Malathion 50 EC treatment zero and negligible per cent seed weight loss was observed in GC-0203, PGCP-3, DCP-15 and TVX-944 but at the end of second month after storage there was increase in seed weight loss. In the control untreated seeds at the end of storage, 100 per cent seed weight loss was observed in genotypes GC-Oll, CAZC-3, HC-98-64, TPTC-l and DCP-17. This study was accordance to other crops and researchers such as in cowpea (Ravindra, 1998), Field bean (Kulkarni, 1990), Khanvilkar and Dalvi (1984), Green gram (Sanjeevaraddi Biradar, 2001), Pramila Gangal on black gram (1999).

From the present study it is clear that, spraying of Quinolphos 25 EC @ 0.05 per cent before harvest would completely eliminate the bruchids infestation on cowpea seeds and this in turn will prevent the carryover of field infestation to the storage. Thus the key to control the bruchid infestation

Table 2: Effect of pre harvest insecticidal application on per cent seed damage in cowpea genotypes during storage

Sr. No	Genotypes	1 MAS			2 MAS		
		Malathion	Quinolphos	Control	Malathion	Quinolphos	Control
1	Rc-101	4.50(12.07)	8.5(16.33)	10.0(18.41)	22.0(27.92)	11.5(19.78)	11.0(19.29)
2	GC-3	11.0(19.35)	4.5(11.73)	13.0(21.12)	18.5(25.47)	5.0(12.85)	16.0(23.41)
3	CoVu-702	20.0(26.55)	4.5(12.07)	9.5(17.8)	55.5(48.15)	47.0(43.27)	12.5(19.4)
4	GC-Oll	6.50(14.67)	5.0(12.65)	23.0(28.65)	14.5(22.35)	24.5(29.57)	99.9(89.42)
5	GC-012	5.00(12.65)	10.0(18.07)	2.5(8.63)	3.5(10.75)	28.0(31.71)	21.0(27.26)
6	GC-0203	0.0(0.0)	27.0(31.30)	31.0(33.83)	18.0(25.09)	27.5(31.62)	66.0(54.35)
7	CAZC-3	5.50(13.54)	16.5(23.84)	19.5(26.20)	7.5(15.81)	99.9(89.42)	99.9(89.42)
8	HC-98-64	17.0(24.34)	8.5(16.88)	61.5(51.64)	80.0(63.68)	3.0(9.83)	99.9(89.42)
9	TPTC-l	8.50(16.59)	8.5(16.94)	18.5(25.47)	13.0(21.12)	0.0(0.0)	99.9(89.42)
10	TPTC-2	10.0(18.23)	3.0(7.08)	19.0(25.83)	99.9(89.42)	0.0(0.0)	20.0(26.53)
11	TC-60l	7.50(15.88)	11.5(19.78)	7.0(15.3)	17.0(24.34)	27.5(31.6)	13.0(21.12)
12	PGCP-3	5.00(12.85)	0.0(0.0)	8.0(16.3)	4.0(11.44)	0.0(0.0)	15.5(23.18)
13	PGCP-5	13.5(21.52)	6.5(14.49)	15.5(23.16)	61.0(51.44)	45.0(42.12)	31.0(33.83)
14	PCP-9711	5.0(12.85)	6.0(13.71)	7.0(15.3)	18.0(25.03)	0.0(0.0)	23.0(28.61)
15	PCP-97197	8.50(16.94)	0.0(0.0)	12.5(20.7)	39.5(38.84)	0.0(0.0)	68.0(55.61)
16	KM-5	7.5(15.12)	7.0(14.19)	8.5(16.88)	8.5(16.94)	7.5(15.88)	17.5(24.67)
17	DCS-7	13.5(21.52)	18.0(25.03)	7.5(15.81)	33.5(35.35)	88.0(69.79)	22.0(27.92)
18	DCP-15	4.5(12.22)	7.0(15.18)	6.5(14.76)	29.0(32.57)	25.0(29.88)	24.0(29.25)
19	DCP-l7	6.5(14.67)	2.5(6.46)	31.0(33.83)	4.5(12.22)	0.0(0.0)	99.9(89.42)
20	KBC-2	10.5(17.53)	2.0(5.76)	7.5(15.88)	24.0(29.25)	0.0(0.0)	14.5(22.13)
21	TVX-944	4.5(12.07)	0.0(0.0)	13.0(21.07)	11.0(19.35)	11.0(19.35)	77.5(61.79)
	Mean	8.31	7.45	15.79	27.73	21.45	45.33
		S.E.±	C.D. (P=0.05)		S.E.±		C.D. (P=0.05)
Genotypes		1.531	5.74		1.260		4.73
Chemicals		0.57	2.17		0.476		1.79
AXB		2.65	9.15		2.183		8.12

MAS-Months after storage Figures in parenthesis indicates square root transformed values for which statistical analysis was done

Table 3: Effect of pre harvest insecticidal application on per cent weight loss in seeds due to infestation of bruchids in cowpea genotypes during storage

Sr. No.	Genotypes	1 MAS			2 MAS		
		Malathion	Quinolphos	Control	Malathion	Quinolphos	Control
1.	Rc-l0l	1.48(7.38)	3.02(9.99)	8.05(16.48)	12.74(20.91)	4.98(12.83)	4.22(11.85)
2.	GC-3	14.87(22.68)	1.99(8.04)	14.45(22.34)	7.14(15.5)	5.59(13.67)	4.08(11.62)
3.	CoVu-702	1.7(7.34)	8.0(16.42))	3.12(10.13)	7.66(16.07)	1.95(8.02)	0.05(1.14)
4.	GC-Oll	3.0(9.92)	1.85(7.78)	4.51(12.25)	3.52(10.79)	10.54(18.93)	100(89.42)
5.	GC-012	1.0(5.49)	0.8(4.35)	1.20(6.20)	1.73(7.53)	9.88(18.31)	3.80(11.22)
6.	GC-0203	0.0(0.0)	4.62(12.40)	1.08(5.69)	7.7(16.10)	9.91(18.34)	28.36(32.17)
7.	CAZC-3	3.72(11.09)	2.92(9.83)	1.65(7.35)	1.67(7.18)	100(89.42)	100(89.42)
8.	HC-98-64	6.5(14.75)	2.09(8.31)	15.09(22.86)	53.71(47.12)	0.38(3.48)	100(89.42)
9.	TPTC-l	8.02(16.45)	3.41(10.63)	5.27(13.27)	6.16(14.35)	0.0(0.0)	100(89.42)
10.	TPTC-2	2.4(8.90)	1.31(6.54)	2.92(9.84)	100(89.42)	0.0(0.0)	2.88(9.76)
11.	TC-601	3.82(11.26)	4.39(12.09)	3.81 (11.25)	8.92(17.37)	7.03(15.37)	4.62(12.40)
12.	PGCP-3	0.86(5.16)	0.0(0.0)	1.50(6.94)	8.09(16.51)	0.0(0.0)	14.21(22.14)
13.	PGCP-5	3.6(10.92)	2.22(8.54)	4.64(12.43)	8.96(17.42)	6.23(14.44)	9.41(17.86)
14.	PCP-9711	5.37(13.39)	4.53(12.27)	0.69(4.62)	7.23(15.60)	0.0(0.0)	3.79(11.17)
15.	PCP-97197	1.26(6.20)	0.0(0.0)	3.91(11.40)	19.02(25.85)	0.0(0.0)	20.01(26.57)
16.	KM-5	2.76(9.55)	5.0(12.92)	2.87(9.75)	1.55(7.03)	0.55(4.24)	9.78(18.22)
17.	DCS-7	1.00(5.68)	10.39(18.80)	0.82(5.17)	8.19(16.62)	17.61(24.81)	10.53(18.93)
18.	DCP-15	0.94(5.51)	3.72(11.12)	1.42(6.84)	2.35(8.80)	10.7(19.09)	7.40(15.7)
19.	DCP-17	1.78(7.65)	2.00(8.06)	4.79(12.63)	0.77(4.02)	0.0(0.0)	100(89.42)
20.	KBC-2	1.25(6.32))	1.35(6.16)	2.30(8.72)	8.05(16.48)	0.0(0.0)	2.86(9.72)
21.	TVX	0.75(4.53)	0.0(0.0)	0.71(4.27)	2.28(8.66)	1.36(6.56	36.39(37.09)
	Mean	3.15	3.03	4.04	13.21	8.89	31.54
			S.E.±	C.D. (P=0.05)	S.E.±		C.D. (P=0.05)
	Genotypes		0.525	1.48	0.39		1.104
	Chemicals		0.198	0.56	0.147		0.417
	AXB		0.909	2.86	0.67		2.01

MAS - Months after storage, Figures in the parenthesis indicates Arc sine transformed values for which statistical analysis was done

in the field is by targeting pod stages and taking up the insecticidal spray.

REFERENCES

Khanvilkar, S.V. and Dalvi, C.S. (1984). Carryover of pulse beetle (*Callosobruchus maculates.* F) infestation from field and its control. *Bull.Grain Tech.*, **22**(1): 54-61.

Kulkarni, S.B.(1990). Bioecology and management of *Callosobruchus theobromae.*L. infesting field bean (*Lablab purpreus.*L) M.Sc. Thesis, University of Agricultural Sciences, Bengaluru, KARNATAKA (INDIA). pp.126.

Padmavathi, C.H., Rafesh Seth and Khan, A. A. (1999). Preferential behaviour of Pulse Beetle *(Callosobruchus maculatus)* in fodder cowpea genotypes: implications for seed quality. *Seed Res.*, **27**(1): 100-105.

Pramila, R. Gangal (2003). Effect of pre harvest insecticidal spray on seed yield and quality and post harvest seed treatment on storability of black gram cv. TAU-I. M.Sc Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Ravindra, A.C. (1998). A study offield infestation on cowpea *(Vigna unguiculata*. L) by the pulse beetle, *Callosobruchus chinensis* L. and its management. M.Sc. Thesis, University of Agricultural Sciences, Bengaluru, KARNATAKA (INDIA).

Sanjeev Araddi Biradar (2001). Influence of pre harvest insecticidal spray on seed yield and quality and post harvest seed treatment on storability of green gram (*Vigna radiate*.L). M.Sc. Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Shashi Bhalla, Manju Lata Kapur and Verma, B.R. (2002). Relative susceptibility of cowpea genotypes to cowpea weevil, *Callosobruchus maculatus. Indian J. Ent.*, **64**(1): 63-67.

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