Biosciences, Biotechnology Research Asia Volume **01**, No. (**1**) 49-52 (2003)

PHYTOTOXIC EFFECTS OF METALAXYL AND GAUCHO ON SEEDLING VIGOUR AND CHLOROPHYLL PIGMENT OF *CAJANUS CAJAN,* MILL DURING EARLY GROWTH

G. Panduranga Murthy and M.S. Sudarshana
Tissue Culture & Crop Physiology Laboratory, P.G. Department of Studies & Research in Botany, University of Mysore, Manasagangothri, Mysore - 570 006, Karnataka (India)

(Received, May 20, 2003)

ABSTRACT

The present work has been carried out, on various parameters in *Cajanus cajan* Mill. cvs. TTB-7 and HYD-3C. The slurry of Metalaxyl (a fungicide) and Gaucho (an insectoside) were made, based on the formulation viz., recommended dosage, above recommended, below recommended and in combination dosage of both the pesticides. On termination day, Metalaxyl and Gaucho in both individually and in combination treatments of higher dosages have severely affected on germination and seedling vigour. When compare to control, the chlorophyll content and dry matter were greatly reduced at in-combination dosage than any other concentrations. But lower dosages did not affect much on germination and growth parameters. The calculated results of vigour index, tolerance index were decreased and the percent phytotoxicity was increased along with the increased and in combination dosages of both the pesticides. The relative susceptibility of HYD-3C has been observed, in both Metalaxyl and Gaucho than TTB-7. When compared with all these treatments, the experimental results clearly showed that better response of the above pulse crop occurred at control.

Keywords: Matalaxyl, Gaucho, Seedling Vigour, Chlorophyll pigment, *Cajanus cajan,* Mill, Phytotoxicity

INTRODUCTION

Pesticides are used extensively to control, a wide array of agricultural pests for growing all most all the crops. However, excessive uses of pesticides produces adverse effects on crop plants and have tendency to penetrate into the tissue of the plants[1].

Application of pesticides have also shown that, they react with cellular constituents producing both physiological, germination changes and also at bio-chemical level[2,3]. Some workers have reported severe effects of pesticides on the seed germinations and have concluded that seed dressing in the form of emulsifiable concentrate were phytotoxic to majority of the crops[4,5]. Hence, the present study was initiated to investigate the toxic effects of a different concentrations of insecticides Gaucho and fungicide Apron, on percent germination, early growth, Phytotoxicity, chlorophyll and Dry weight of two cultivator varieties of Red gram.

MATERIAL AND METHODS

Certified breeders seed samples of Red gram cultivar variety TTB-7 and HYD-3C were procured from the Department of Pulses of Gandhi Krishi Vidyalaya Kendra (G.K.V.K.) U.A.S. Bangalore, Gaucho (insecticide seed treatment) and Apron (fungicide seed treatment) were obtained from authorised company Bangalore.

The slurry of both the pesticides, recommended dosage of Gaucho - 10 gms/kg and Apron - 6gms/kg of seeds were prepared. In order to observe the variations, 25% of the above recommended, 25% of the below recommended and also incombination of both Gaucho and Apron 50% among recommended were prepared.

Prior to treatment, the seeds of two cultivar varieties were surface sterilized with 0.1% Mercuric chloride for 10 minutes and washed thoroughly with distilled water for 4-5 times. For each treatment 25gms of seeds were taken and replicated for four times. The seeds were mixed thoroughly in all the concentrations of both the pesticidal slurry and kept for 24 hours. Then they were subjected for germination in germinator at 28±2°C using Between paper method.

Table - 1 : Effect of presowing seed treatments with Gaucho and Apron on germination, early growth, phytotoxicity, chlorophyll content and Dry weight in pigeon pea cv. TTB-7 and Hyd-3C

Treatments		CROP CV	Germ (%) AM±SD	R.L. (cms) AM±SD	S.L. (cms) AM±SD	V.I. AM±SD	T.I. AM±SD	P.P. (%) AM±SD	PIGEON PEA CHL. 'a' (mg-g-1) AM±SD	CHL 'b' (mg-g-1) AM±SD	Total CHL. (mg-g-1) AM±SD	Dry weight (gms) AM±SD
Control		TTB-7	97.67±1.69	12.1760±0.24	9.1905±0.21	2706.00±43.77	-	-	0.0281±0.00	0.0215±0.00	0.0496±0.00	1.30±0.03
		Hyd-3C	89.00±3.16	9.0011±0.09	5.9236±0.041	1328.40±34.98	-	-	0.0155±0.00	0.0197±0.00	0.0354±0.00	0.88±0.01
	BR	TTB-7	89.66±1.69	9.9729±0.219	8.173±0.268	162784±72.92	81.96±3.19	18.03±3.19	0.0196±0.00	0.0167±0.00	0.0362±0.00	0.99±0.02
		Hyd-3C	75.00±1.00	7.0824±0.155	4.9415±0.079	902.02±29.7	78.67±0.86	21.31±0.86	0.0100±0.00	0.0120±0.00	0.0221±0.00	0.70±0.01
Gaucho Dosages	RD	TTB-7	68.66±2.05	8.2982±0.276	7.1192±0.115	1058.20±17.93	68.20±3.31	31.78±3.31	0.0127±0.00	0.0076±0.00	0.0204±0.00	0.89±0.007
		Hyd-3C	55.00±1.00	6.2035±0.324	4.2627±0.15	575.49±0.90	68.95±4.35	36.03±0.63	0.0056±0.00	0.0070±0.00	0.0127±0.00	0.62±0.01
	AR	TTB-7	60.66±1.82	7.3766±0.278	6.264±0.37	827.80±43.14	60.65±3.43	39.34±3.43	0.0075±0.00	0.0066±0.00	0.0142±0.00	0.82±0.01
		Hyd-3C	50.50±7.50	4.7727±0.18	3.4164±0.20	414.13±31.93	53.04±2.59	46.94±2.58	0.0034±0.00	0.0042±0.00	0.0077±0.00	0.57±0.01
	BR	TTB-7	80.33±2.94	8.9683±0.178	6.8261±0.329	1264.04±60.41	73.65±0.77	26.33±0.77	0.0119±0.00	0.0096±0.00	0.0216±0.00	0.85±0.01
		Hyd-3C	68.00±1.0	6.2203±0.241	4.586±0.144	734.79±4.138	69.08±1.93	30.91±1.93	0.0076±0.00	0.0080±0.00	0.0157±0.00	0.67±0.014
Apron Dosages	RD	TTB-7	70.33±2.62	7.3809±0.083	5.0570±0.11	874.63±28.18	60.62±0.55	39.40±0.56	0.0074±0.00	0.0062±0.00	0.0136±0.00	0.60±0.01
		Hyd-3C	56.50±0.05	5.3818±0.02	3.7578±0.05	516.37±3.04	59.79±0.98	40.19±0.98	0.0047±0.00	0.0057±0.00	0.0104±0.00	0.44±0.01
	AR	TTB-7	59.33±2.86	6.8023±0.147	4.3062±0.279	670.04±16.87	55.90±2.17	44.08±2.17	0.0036±0.00	0.0028±0.00	0.0065±0.00	0.49±0.014
		Hyd-3C	46.50±1.44	4.2179±0.123	2.4591±0.147	311.14±29.049	46.84±0.49	53.14±0.79	0.0025±0.00	0.0029±0.00	0.0054±0.00	0.32±0.03
Gaucho + Apron	I+F	TTB-7	56.33±1.24	6.0476±0.12	4.0043±0.14	566.15±15.81	49.67±0.51	50.32±0.51	0.0028±0.00	0.0021±0.00	0.0050±0.00	0.42±0.01
		Hyd-3C	37.50±1.5	3.7724±0.05	2.0395±0.05	218.11±12.67	41.91±1.07	58.07±1.12	0.0017±0.00	0.0020±0.00	0.0040±0.00	0.15±0.01

Germ : Germination %, RL : Root Length, SL : Shoot Lenght, VI : Vigour Index, TI : Tolerance Index, PP : Percent Phytotoxicity, CHL : Chlorophyll, AM : Arithmetic Mean, SD : Standard Deviation, CV : Cultivar Varieties, BR : Below Recommended dosage, RD : Recommended Dosage, AR : Above Recommended dosage, I+F : Insecticide + Fungicide

Values are mean of ± SD based on three determinations

According to International Seed Testing Association 1985 on the termination day (6th day for Red gram) of the experiment, percent germination, seedling growth, Radicle length and Plumule length were recorded. Chlorophyll was estimated at 8th day old seedlings[6], in both the crops, Vigor index[7], Tolerance index[8] and percent Phytotoxicity[9] were calcualted.

All the tabulated data were analysed using Arithmetic mean and standard deviation of three determination[10,11].

RESULTS AND DISCUSSION

Germination was severely inhibited at higher concentrations of both the pesticides i.e., 37.67% reduction in Gaucho, 38.34% reduction in Apron and 44.34% reduction of germination percentage at incombination treatment over control of 97.67% in cultivar variety TTB-7. And in case of Hyd-3C 38.5% reduction in Gaucho, 42.5%, reduction in Apron and 51.5% reduction of germination at incombination treatment over control of 89%.

This clearly indicates that the inhibitory action of insecticide and fungicide on the metabolic activities[12,13,14] and gradual decrease in the length of radicle and plumule along with the increase in concentration and incombination treatment of both the pesticides[15]. The early growth inhibition of root and shoot at higher concentration indicates the effect on cell division and cell elongation[16].

The Chlorophyll content was greatly reduced at incombination treatments than other concentrations of both the pesticides[17]. The percent phytotoxicity and the calculated results of vigor index and Tolerance index were also drecreased with the increase in concentrations and incombination treatments in both the cases[18].

Further when the dry weight was estimated, it has been observed that nearly 75% reduction in Gaucho and 85% reduction in Apron of incombination treatment over higher concentrations and control.

In the present study (as shown in the table), an inhibitory effect has been observed on seed germination, early growth pigment content, percent phytotoxicity and Dry weight of Red gram cv. TTB-7 and Hyd-3C at incombination dosage and higher concentrations of both the pesticides. But below recommended dosage did not affect major change in germination and other parameters in both the cases. The more susceptibility of Hyd-3C has been observed in both Gaucho and Apron, when compare to cv. TTB-7.

ACKNOWLEDGEMENT

The authors are grateful to Dr. G.R. Shivamurthy, Prof and Chairman, Dept. of Studies and Research in Botany, University of Mysore for providing necessary facilities to carry out this work.

REFERENCES

1. Sreenivasa Rao, A. and Rammohan Rao, P., Study on Pesticide Residues in Vegetables, *Poll Res.,* **19**(4), 661-664 (2000)

2. Zutshi U. and Kaul, S.L., Cytogenetic activity of some common fungicides in higher plants, *Cytobios,* **12,** 61-67 (1975)

3. Shrisat, A.M. and Kale V.V., Effect of fungicide treatment on germination and seedling vigour of Chick pea (*Cicer arietinum*) *Tropical grain legume bull.,* **16,** 29-32 (1979)

4. Casida J.E. and Lykken L., Mechanism of organic pesticide chemicals in higher plants, *Ann. Rev. Pl. Physiol.,* **20,** 607-636 (1969)

5. Patil T.M. and Shirashyad, V.S. Effect of Methylpatathion and Phosphamidon on seed germination and on the activity of perosidase and α-amylase in some vegetable seeds, *Geobios,* **16**(2-3), 57-60 (1989)

6. Arnon, D.I., Copper enzymes in isolated chloroplast, Polyphenoloxidase in *Beta vulgaris*, *Plant Physio.,* **24**, 1-15 (1949)

7. Abdul Baki A.A. and Anderson J.D., Vigour determination of soyabean seed by multiple criteria, *Crop. Sci.,* **3,** 630-633 (1973)

8. Turner, L.G. and Marshal C., Accumulation of zinc by subcellular fraction of root of

Agrostis tennis sibth in relation to zinc tolerance, *New Phytol.,* **71,** 671-676 (1972)

9. Chou, C.H., Chiang, Y.C. and Rao, C.I., Impacts of water pollution on crop growth in Taiwan, *Bot. Bull Academic Sinica,* **19,** 107-124 (1978)

10. New man, D., The distribution of range of samples from a normal population expressed in terms of an independent estimate of Standard Deviation, *Biometrica,* **31,** 20 (1939)

11. Keul, M., The use of studentized range in connection with an analysis of variance, *Euphytica,* **1,** 112 (1952)

12. Krishnamurthy, P. and Rao, D., Effect of two fungicides on germination and growth in *Brassica nigra* Koch. *Ibid*., **7,** 160-161 (1980)

13. Reddy, J.M.K. and Vidyavathi, P., Effect of fungicide on the growth and seedling metabolism of *Doliches biflorus*, *Geobios,* **10,** 174-178 (1984)

14. Chakravarthi, S.K., Effect of Bavistin 25 DS on germination and seedling vigour of Wheat, *Pesticides,* **3,** 23-26 (1986)

15. Gupta R.C., B.e.g. M.U. and Chandel, P.S., Effect of Endosulfan on the seed germination and seedling growth of Vigna radiata Linn., *Pestology,* **7,** 25-28 (1983)

16. Somashekar, R.K. and Sreenath K.P., Effect of fungicide Benlate on germination and seedling growth of plants, *Geobios,* **14,** 93-96 (1987)

17. Ramulu, C.A. and Rao D., Effect of Monocrotophos on seed germination, growth and chlorophyll content of Custered bean, *Comp. Physiol. Ecol.,* **12,** 102-105 (1987)

18. Dakshinamoorthy, T. and Sivaprakasam, K., Effect of seed treatment with fungicides and insecticides on the seedling vigour (pearlmillet) *Madras. Agric. J.,* **76,** 166-169 (1989)