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RESPONSE OF HORSE GRAM {*MACROTYLOMA UNIFLORUM* (LAM.) VERDC} TO THIOUREA APPLICATION UNDER RAINFED CONDITIONS

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ABSTRACT

Field experiments were conducted under AICRP on Arid Legumes during *rabi* seasons 2000-2002. Three years mean data revealed that thiourea application has significant influence on horse gram productivity. Soaking of horse gram seeds in 500 ppm thiourea followed by two sprayings of thiourea (500 ppm) one at vegetative and one at flowering stage proved most effective and increased the seed yield of horse gram by 57.88%. This treatment was proven economically beneficial as it gave additional net return of Rs. 2271 compared to control.

Horse gram is a photosensitive pulse crop grown during the second crop season. It shows good adaptability to a wide range of soils It serves as a multipurpose crop providing protein rich human food, feed and fodder for animals and as a green manure to enrich soil fertility and is well known for its medicinal (diuretic) properties. Horse gram is one of the under-exploited grain legumes with great potential in sustainable agriculture. However, due to its low yield potentiality it is usually broadcast with out any agronomic management. A relatively recent development in crop production is the use of growth regulators to modify and control plant growth and development. Improvement in plant growth and development due to application of thiourea has been reported in crops grown in arid and semiarid region (Sahu *et al.*, 1993). Thiourea a sulphahydral compound is known to improve the pulses productivity and its role as a drought ameliorant is well established. ICAR (1999) reported the role of thiourea seed soaking and foliar sprays in increasing the seed yield of arid legumes. The present study was therefore undertaken to assess the effect of thiourea seed treatment on seedling emergence and crop establishment and also to study the role of thiourea in improving seed set and yield of cowpea in the oxisols of Kerala.

Field experiments were conducted under AICRP on Arid Legumes at Regional Agricultural Research Station, Pattambi during *rabi* seasons 2000-2002. The soil was sandy loam in texture with pH 5.6. It contained organic carbon 1.10 per cent, 20 kg ha^{-1} available P and 110 kg ha^{-1} K. The test variety KS-2, was sown at a spacing of 30 x 15 cm. Fertilizers were applied at the rate of 20 kg N, 25 kg P_2O_5 and 10 kg K_2O ha^{-1}. The experiments were laid out in randomized block design with three replications. The treatments included were T1 - control, T2 - seed soaking in 500 ppm thiourea, T3 - seed soaking in water, T4 - one spray of 500 ppm thiourea at vegetative stage, T5 - one spray of 500 ppm thiourea at flowering stage, T6 - two sprays of thiourea one at vegetative and one at flowering stage, T7 - T2+T4, T8 - T2+T5, T9 - T2+T6, T10 - T3+T4, T11 - T3+T5 and T12 - T3+T6. Observations on the growth and yield attributes were taken at the time of harvest.

Three years pooled data revealed that thiourea application has significant influence on growth and yield characters of horse gram (Table 1). Plant height, dry matter production, 100 seed weight and harvest index were found significantly increased by the treatments. Seed soaking in 500 ppm thiourea combined with two foliar sprays of 500 ppm thiourea one at

Table 1. Effect of thionrea application on growth and yield attributes of horse gram

Treatment	Height (cm)	No. of branches	Dry matter kg ha^{-1}	Pods per plant	Pod length (cm)	Seeds per pod	100 Seed weight	Harvest index
T1	32.00	2.62	1060.69	14.00	4.10	5.28	3.21	36.20
T2	37.31	2.61	1163.51	16.08	4.17	5.22	3.37	41.81
T3	37.28	2.55	1157.29	16.55	4.12	4.97	3.26	38.63
T4	3686	2.34	1175.87	16.13	4.17	5.28	3.39	42,63
T5	35.71	2.60	1144.97	16.48	4.07	5.06	3.41	41.24
T6	37.46	2.02	1161.36	16.35	4.16	5.22	3.35	41.11
T7	35.57	2.03	1216.39	16.02	4.04	5.21	3.40	41.47
T8	3673	2.25	115044	1600	4.42	520	3.57	41.40
T9	40.60	2.75	1334.47	17.60	4.20	5.31	3.82	45.37
T10	36.40	2.08	1121.98	15.64	4.11	5.02	3.34	41.51
T11	36.00	2.26	1198.02	15.69	4.17	5.02	3.36	42.48
T12	3582	1.94	120927	14.51	4.17	5.08	3.38	42.66
CD at 5%	2.60	NS	75.17	NS	NS	NS	0.22	2.93

Table 2. Effect of thiourea application on yield and economics of horse gram

Treatments	Yield kg ha^{-1}			Pooled yield	% increase kg ha^{-1}	Additional cost over control	Net return Rs. ha^{-1}	BC ratio Rs. ha^{-1}
	2000	2001	2002					
T1	209.28	311.26	498.39	339.65	-	-	95	1.01
T2	310.75	406.58	561.06	426 16	25.47	58	1334	1.26
T3	212.80	429.61	633.04	424.81	25.07	50	1322	1.26
T4	286.21	438.26	527.16	417.21	22.83	310	948	1.17
T5	269.62	356.73	561.68	396.01	16.59	310	630	1.11
T6	25713	40307	51392	391,37	15.22	620	251	1.04
T7	268.64	435.60	519.84	408.03	20.13	368	752	1.14
T8	263.06	382.49	655.29	433.61	27.66	368	1136	1.21
T9	381.03	540.77	686.96	536.25	57.88	678	2366	1.41
T10	22161	41922	604.95	415.26	22.26	310	918	1.17
T11	289.34	440.08	676.48	468.41	37.90	310	1716	1.32
T12	284.10	432.35	684.95	467.13	37.53	620	1386	1.24
CD at 5%	78.01	94.55	65.79	44.61				

vegetative and one at flowering stage recorded the highest plant height (40.60 cm), dry matter production (1334 kg ha^{-1}), 100 seed weight (3.82g) and harvest index (45.37). Other characters *viz.*, number of branches, pods per plant, pod length, seeds per pod etc. though not significant, were more in this treatment. Beneficial effects of thiourea on growth and yield attributes of cowpea was reported by Yadav *et al.*, 2003. Better partitioning of dry matter and 25% increase in harvest index has been noticed in treatment receiving both seed soaking and foliar sprays. Thiourea helps in the transport of photosynthates to seed. This may be the reason for increased 100 seed weight and harvest index in thiourea applied treatments. The integrated effect of these growth and yield attributes resulted in significant increase in yield and ultimately net return by thiourea application. Pooled data revealed that the effect of different treatments on yield of horse gram was significant The highest yield was obtained with seed soaking in 500 ppm thiourea combined with two foliar sprays of 500 ppm thiourea one at vegetative and one at flowering stage (536 kg ha^{-1}). This treatment recorded 57.88% more yield compared to control. Similar trials were

conducted at Bangalore, showed that seed treatment and foliar sprays of thiourea significantly increased the grain yield of horse gram in comparison to control (Anonymous, 1999). Similar results were obtained in horse gram (Anitha *et al.*, 2001a), in cowpea (Sharma, 2000; Anitha *et al.*, 2001b and Yadav *et al.*, 2003), in cluster bean (Bhadoria and Kushwaha, 2000), in moth bean (Shekhawat *et al.*, 2002; Ghanshyam and Pareek, 2002) and in dew bean (Ishwar Singh *et al.*, 2002). The increase in yield due to thiourea application is a clear reflection of increase in growth and yield attributes. The yield increase by the application thiourea may due to the beneficial effect of thiourea on seed germination, seedling growth, chlorophyll content, protein content, biomasss production and better dry matter partitioning as reported by Parihar *et al.*, 1988; Sahu *et al.*, 1993 and Sharma *et al.*, 2002. The action of thiourea is under stress situations. In sulphur containing amino acids, there is a breakdown of SH group into S and H under stress situations. Thiourea helps to correct it by forming SH group, it stabilizes the enzymes and proteins. It also increases the net photosynthates and nitrate reductase activity. This may be the reason for yield increase due to thiourea application. The palatability of cooked grain of horse gram from thiourea applied treatments and control were tested and found that the palatability of grain was not affected by thiourea application.

Maximum net return was obtained with seed soaking in 500 ppm thiourea combined with two foliar sprays of 500 ppm thiourea one at vegetative and one at flowering stage (Rs. 2366 ha^{-1}). This treatment recorded Rs. 2271 more net return compared to control. Benefit cost ratio was also followed the same trend. Maximum net profit with soaking of seeds in thiourea followed by its sprays at vegetative and flowering stages was reported in cowpea (Bhadoria *et al.*, 2002 and Yadav *et al.*, 2003) in cluster bean (Bhadoria and Kushwaha 2000) and in moth bean (Ghanshyam and Pareek, 2002).

On the basis of above results it may be concluded that thiourea application has significant influence on horse gram productivity Soaking of horse gram seeds in 500 ppm thiourea followed by its sprays (500ppm) one at vegetative and one at flowering stage resulted in good productivity of horse gram and was most remunerative.

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