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# Sensitivity of Clusterbean to Three Dinitroanilines in Different Soils

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*Cyamopsis tetragonoloba* (L.) Taub. (clusterbean or guar) is an important rainy season drought resistant grain legume grown extensively on the dry lands of India. It is being raised for nutritious fodder, green manuring, pods for vegetable and seed purposes. Besides being an industrial crop because of its high gum and protein content, it also adds to the soil fertility by fixing atmospheric nitrogen and by the addition of organic matter. But it is also encountered with weeds, which often become difficult to control manually particularly in rainy season. The performance of various dinitroaniline herbicides used in this crop have been found erratic and variable levels of crop phytotoxicity depending upon different soil types have also been reported elsewhere (Kumar *et al.*, 1994; Kumar *et al.*, 1996; Yadav *et al.*, 1998). It is also being argued that dinitroanilines could also be instrumental directly or indirectly in enhancing the impact of colour rot disease in clusterbean. Seed treatment with bavistin at 2 g $kg^{-1}$ seed and/or soil drenching with bavistin at 0.2% solution have been

Table 1. Effect of dinitroaniline herbicides on germination and dry weight of clusterbean in bavistin drenched and undrenched sandy soil at 30 days after treatment

| Herbicide (kg $ha^{-1}$) | Germination (%) 1998 | | Dry weight (mg/5 plants) 1998 | |
|---|---|---|---|---|
| | Drenched | Undrenched | Drenched | Undrenched |
| **Fluchloralin** | | | | |
| 0.0 | 80.0 | 86.6 | 650 | 620 |
| 0.125 | 73.3 | 80.0 | 650 | 625 |
| 0.25 | 68.6 | 60.0 | 639 | 537 |
| 0.5 | 40.0 | 33.3 | 450 | 360 |
| 1.0 | 13.3 | 13.3 | 337 | 302 |
| 2.0 | 5.5 | 6.0 | 225 | 207 |
| LSD (P=0.05) | - | - | 39 | 46 |
| **Pendimethalin** | | | | |
| 0.0 | 86.6 | 86.6 | 770 | 650 |
| 0.125 | 80.0 | 73.3 | 712 | 591 |
| 0.25 | 80.0 | 66.6 | 545 | 434 |
| 0.5 | 40.0 | 40.0 | 384 | 260 |
| 1.0 | 36.6 | 26.6 | 321 | 250 |
| 2.0 | 8.5 | 10.0 | 285 | 215 |
| LSD (P=0.05) | - | - | 33 | 27 |
| **Trifluralin** | | | | |
| 0.0 | 86.6 | 80.0 | 630 | 654 |
| 0.125 | 80.0 | 70.0 | 635 | 521 |
| 0.25 | 60.0 | 43.3 | 417 | 455 |
| 0.5 | 50.0 | 33.3 | 310 | 248 |
| 1.0 | 20.0 | 16.6 | 255 | 157 |
| 2.0 | 6.5 | 5.0 | 232 | 133 |
| LSD (P=0.05) | - | - | 18 | 21 |

recommended as a control measure against this disease. Keeping these points in view, pot culture studies were conducted on raised platform under field conditions in the research area of CCS Haryana Agricultural University, Hisar, India diring 1998 and 1999.

During 1998, three separate pot experiments were undertaken to see the sensitivity of clusterbean to fluchloralin (Basalin, 45% EC), pendimethalin (Stomp, 30% EC) and trifluralin (Treflan, 48% EC) each at 0.0, 0.125, 0.25, 0.5, 1.0 and 2.0 kg a. i. $ha^{-1}$ applied as pre-plant incorporation (PPI) in bavistin drenched and undrenched sandy soil collected from village Ludas, district Hisar, Haryana (Table 1). The soil was sieved before use. The soil composition constituted mainly pure sand (> 80%) and it was low in fertility with pH around 8.0. Earthen pots of 30 cm height and 15 cm top radius were filled with the soil weighing approximately 5.0 kg and soil drenching with bavistin at 0.2% solution was accomplished before spray as per the treatment requirement. An area of 10.0 m x 2.0 m was marked on ground and pots replicated thrice were arranged in that measured area before spray. The herbicides were applied with knapsack sprayer fitted with flat fan nozzles using 625 l water $ha^{-1}$ and well mixed in upper 0-5 cm soil layer before sowing. Fifteen seeds $pot^{-1}$ of clusterbean variety HGS-365 were sown just after spray on 22 November during 1998. Seed treatment with bavistin @ 2.0 g/kg was also given to seeds meant for sowing only in the pots containing bavistin treated soil. The pots were arranged in complete randomized design and watered as per requirement. The data on germination (%) and dry weight of shoot (mg/5 plants) in 1998 were recorded at 30 days after treatment (DAT). During 1999, two sets of pot experiments were conducted for testing sensitivity of clusterbean against pendimethalin at 0.0, 0.125, 0.25, 0.5, 1.0 and 2.0 as PPI or pre-emergence (PE) separately in sandy loam and sandy soils (Table 2). The sandy loam soil (62% sand, 17% clay and 21% silt, and low to medium in fertility with a pH of 8.1) was collected from Research Farm of CCS Haryana

Table 2. Effect of pendimethalin applied as pre-emergence or pre-plant on the dry weight of clusterbean in bavistin drenched and undrenched soils at 30 days after treatment

| Herbicide ($kg\ ha^{-1}$) | Dry weight (mg/10 plants) in 1999 | | | |
|---|---|---|---|---|
| | Sandy loam soil | | Sandy soil | |
| | DR | UNDR | DR | UNDR |
| **Pendimethalin (PPI)** | | | | |
| 0.0 | 1127 | 1134 | 1074 | 1113 |
| 0.125 | 1090 | 1097 | 899 | 1078 |
| 0.25 | 1084 | 1108 | 807 | 905 |
| 0.5 | 1109 | 1113 | 717 | 767 |
| 1.0 | 1083 | 1098 | 528 | 604 |
| 2.0 | 986 | 935 | 476 | 574 |
| LSD (P=0.05) | 84 | 113 | 79 | 57 |
| **Pendimethalin (PE)** | | | | |
| 0.0 | 1339 | 1404 | 1074 | 1060 |
| 0.125 | 1376 | 1418 | 1097 | 1065 |
| 0.25 | 1350 | 1464 | 1075 | 1097 |
| 0.5 | 1339 | 1432 | 1092 | 1075 |
| 1.0 | 1343 | 1409 | 946 | 965 |
| 2.0 | 1307 | 1385 | 763 | 708 |
| LSD (P=0.05) | NS | NS | 67 | 109 |

DR–Seed treated and soil drenched with bavistin.
UNDR–Seed untreated and soil undrenched with bavistin.
NS–Not Significant.

Agricultural University, Hisar. The sandy soil from village Ludas was same as explained earlier. The sowing in pots was accomplished on 22 November 1999. The bioassay procedure and experimental design were similar as adopted in the year 1998 except that shoot dry weight of 10 plants $pot^{-1}$ was recorded in 1999 at 30 DAT.

All the three dinitroanilines significantly reduced the germination and dry weight of clusterbean with corresponding increase in their doses in 1998 (Table 1). Pre-plant incorporation (PPI) of pendimethalin was more detrimental compared to its pre-emergence (PE) applications and also its phytotoxicity levels on clusterbean were higher in sandy soil compared to sandy loam soil during 1999 (Table 2). Herbicides applied as PPI were mixed in upper 0-5 cm soil layer and might have come in direct contact with seed, and thus could have caused more toxicity compared to their PE applications. Severe phytotoxicity to clusterbean grown in sandy soil but not in sandy loam soil has been reported earlier also (Kumar *et al.*, 1994; Budhiraja *et al.*, 1998a, b; Yadav *et al.*, 1998). Seed treatment and soil drenching with bavistin could help to reduce the toxicity of dinitroanilines only to the extent of 0-15% in different years of study, however, its effects were quite erratic in different years and soil types (Tables 1 and 2). It appears that the toxicity caused by dinitroanilines (Tables 1 and 2) was due to direct adverse effects of these three dinitroanilines. However, to further exclude the possibilities of their indirect effect in terms of inducing infestation of colour rot disease or not, the soils under test need to be infected with inoculums/spores of the disease before spray. Further studies under field conditions could be of worth in understanding the differential impact of dinitroanilines.

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