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Seed Production Potential and Germination Behaviour of Five Problematic Weed Species of Winter Season

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Management of weeds requires a complete understanding of seed germination and seedling establishment as well as physiology of growth of the weed species. Weeds can produce tens or hundreds of thousands of seeds per plant and deposit these seeds back to the soil contributing to the build up of a rich seed bank year after year. Germination or dormancy of weed seeds in the seed bank determines the extent of weed infestation in the succeeding crops. Composition and density of weed infestation in crops can, therefore, be predicted from the composition of soil seed bank (Buhler *et al.*, 1997) and the germination behaviour of weed seeds. As seed dormancy and germination are regulated by a complex interaction of environmental, edaphic, physiological and genetic factors, it is therefore imperative to generate information on the dormancy and germination behaviour of weed species that can be utilized in weed management programmes.

Certain chemicals such as KNO_3, thiourea, H_2O_2 and the growth regulator GA_3 have been reported to break dormancy and promote germination of weed species. The present investigation was carried out with an objective to estimate the seed production potential and the effect of different chemicals on the germination behaviour of five weed species of winter season viz., *Phalaris minor, Medicago denticulata, Avena ludoviciana, Vicia hirsuta* and *Vicia sativa*. For estimating seed production potential, 10 matured plants of each species, which were allowed to grow under non-competitive conditions, were collected from Crop Research Centre, Pantnagar. The seeds were collected, counted and the test weight (1000-seed) was determined. Effect of different chemicals on germination was assayed in petridishes under laboratory conditions. Seeds of the weed species collected in the previous season (one year old) were sterilized by 0.1% $HgCl_2$ and then washed 4-5 times with distilled water. Ten seeds of each species were transferred onto a layer of cotton over an agar layer in glass petri plates. Different concentrations of KNO_3, H_2O_2 , thiourea and gibberellic acid (GA_3) were applied to the seeds. The petri plates were then kept either at room temperature or in an incubator at 20±2°C. Data on per cent germination were recorded seven days after incubation.

Large variations were observed in the seed production potential among both the monocot as well as BLWs. Both *P. minor* and *M. denticulata* recorded higher number of seeds per plant (11,885 and 10,124, respectively). On the other hand, *A. ludoviciana, V. hirsuta* and *V. sativa* produced lower number of seeds per plant (327, 329 and 345, respectively). The test weight (1000-seed) was minimum (1.40 g) in *P. minor* followed by *M. denticulata* (3.24 g), while *V. hirsuta* recorded the maximum test weight (31.30 g). This shows that the number of seeds was negatively correlated with seed size and thus, with the test weight. Higher the number of seeds produced, higher will be the population of that individual in the next season, depending upon the seed viability. The germination percentage of *P. minor, A. ludoviciana, V. hirsuta, M. denticulata* and *V. sativa* under laboratory conditions varied between 15-30% (Figs. 1-4). This indicates that at 25% germination level, a single plant of *P. minor* can give rise to 2972 individuals in the next season. Nitrogenous compounds such as KNO_3 have been reported to potentiate germination of different species of light requiring seeds. Germination of *A. fatua* has been reported to be promoted by 50 to 100 mM KNO_3 and its emergence was increased even at 200 mM of KNO_3 (Adkins and Adkins, 1994; McIntyre *et al.*, 1996). In the

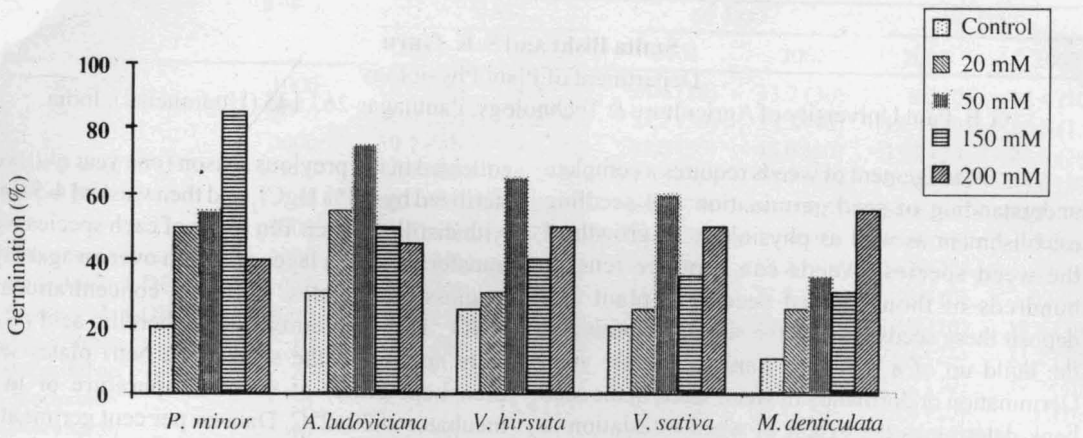

Fig. 1. Effect of KNO_3 on germination of weed species.

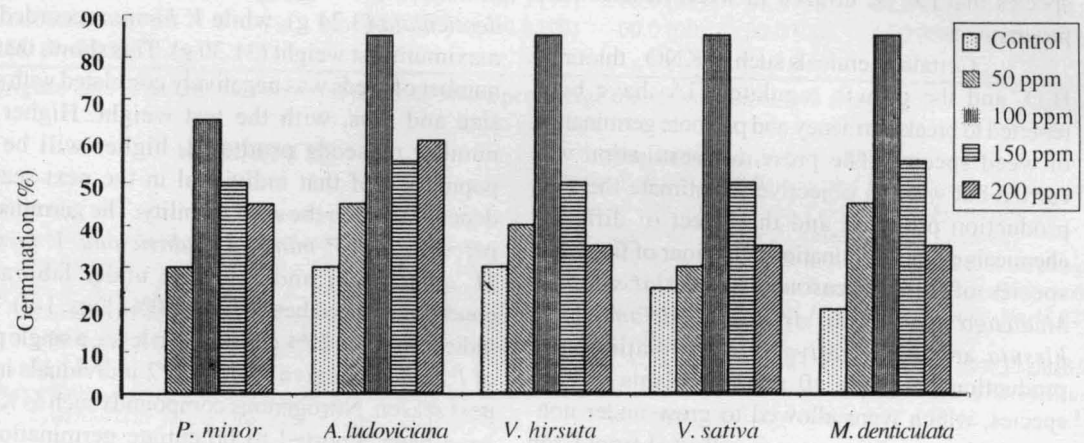

Fig. 2. Effect of GA_3 on germination of weed species.

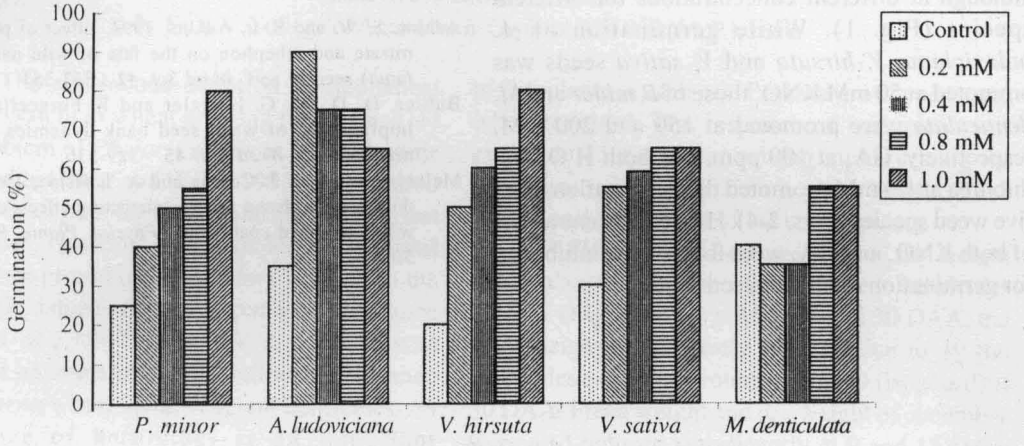

Fig. 3. Effect of H_2O_2 on germination of weed species.

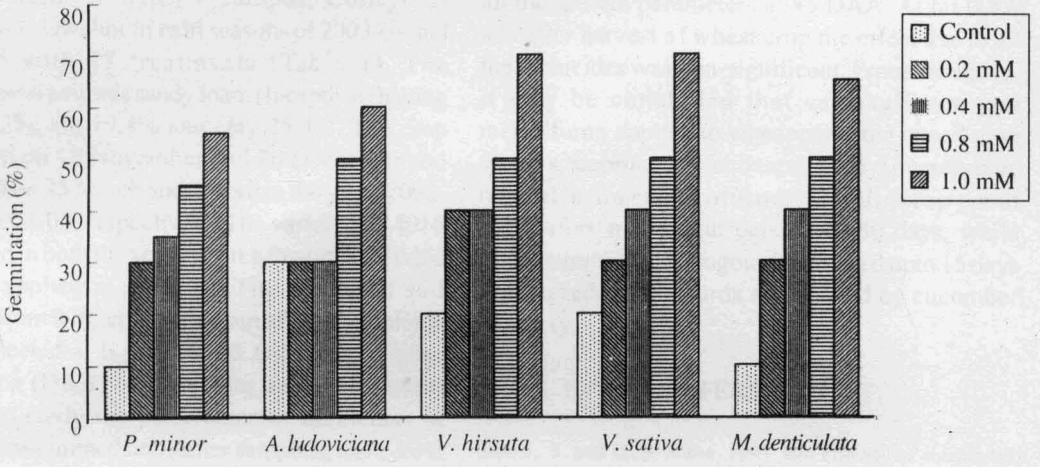

Fig. 4. Effect of thiourea on germination of weed species.

present investigation also, KNO_3 promoted the germination of all the weed species under study although at different concentrations for different species (Fig. 1). While germination of *A. ludoviciana*, *V. hirsuta* and *V. sativa* seeds was promoted at 50 mM KNO_3 those of *P. minor* and *M. denticulata* were promoted at 150 and 200 mM, respectively. GA_3 at 100 ppm, and both H_2O_2 and thiourea at 1.0 mM promoted the germination of all five weed species (Figs. 2-4). Higher concentrations of both KNO_3 and GA_3 were found to be inhibitory for germination of all the weed species.

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