

Major weeds and their management in Uttarakhand

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Uttarakhand represents a unique geographical area where altitude ranges from 200 m to up to more than 2400 m above MSL. The soil, climate and rainfall offer greatly from place to place. The climate varies from sub-tropical to temperate, where the annual rainfall ranges from 1200-2500 mm and temperature varies from less than freezing point in higher hills to more than 40 °C in the plains. In terms of agro-climatic conditions, the state has got plains of Haridwar, *Tarai* region represented by Udham Singh Nagar and some “*Bhabar*” areas of Nainital, Dehradun and Champawat districts. The remaining part represents the hill region.

In the plains, particularly in the *Tarai* and *Bhabar* region, the climate and highly productive soils favour luxuriant growth of many weed species. During rainy season, annual grasses like *Echinochloa colona*, *E. crus-galli*, *Eleusine indica*, *Brachiaria ramosa*, *Dactyloctenium aegyptium*, *Paspalum distichum*, *Digitaria* spp. and perennial grasses like *Sorghum halepense*, *Phragmites karka*, *P. comunis* and *Cynodon dactylon* are the major weeds in crops like maize, soybean, rice, sugarcane, kharif pulses and vegetable crops. Sedges like *Cyperus rotundus*, *C. iria*, *C. difformis*, *Scirpus* spp. and *Fimbristylis milliacea* are very common in the rice fields. Among non-grasses, *Trianthema monogyna*, *Celosia argentea*, *Commelina benghalensis*, *Commelina diffusa*, *Cleome viscosa*, *Caesulia axillaris*, *Cynotis axillaris*, *Eclipta alba*, *Euphorbia hirta*, *Lindernia* spp., *Ludwigia* spp., *Sphenoclea zeylanica*, *Alternanthera sessilis* are common during rainy season. *Ischaemum rugosum*, *Eragrostis japonica* and *Leptochloa chinensis* are becoming serious problem in the rice crop. Several species of *Ipomoea* have become serious problem in the sugarcane fields. Density of *Trianthema monogyna* is on continuous increase in almost all upland crops grown during rainy, spring and summer seasons.

During winter season, the major weeds in crop fields are *Phalaris minor*, *Avena ludoviciana*, *Chenopodium album*, *Melilotus alba*, *M. indica*, *Medicago denticulata*, *Fumaria parviflora*, *Vicia sativa*, *Anagalis arvensis* and *Lathyrus aphaca*, at some places, *Polypogon monspeliensis*, *Poa annua*, *Lolium temulentum*, *Cirsium arvense* and *Convolvulus arvensis* are also found infesting rabi crops. Due to continuous use of isoproturon and 2,4-D in wheat, the weeds *Lathyrus aphaca*, *Melilotus indica*, *Rumex* spp. and *Medicago denticulata*, which are normally not controlled by these herbicides, are increasing.

In wastelands and roadsides, the problem of *Parthenium hysterophorus* and *Lantana camera* are very common. In orchards, gardens and lawns, *Imperata cylindrica* has been found to be the most problematic weed.

Negligence towards weed management is one of the most important factor responsible for low productivity of crops, as the losses due to weeds ranges from 10-90% under different agro-climatic conditions of Uttarakhand. The reduction in crop yield due to weeds depends upon crop cultivar, weed species & density, cropping system, plant spacing, fertility and moisture status of the soil, climate as well as environmental conditions. In Uttarakhand, except Udham Singh Nagar, Haridwar and plains of Dehradun and Nainital districts, the crops are mostly grown in rainfed areas where soil moisture and nutrients are the most limiting factors & weeds compete for these major resources very much. Adoption of appropriate weed management options would improve crop productivity in different crops and cropping system of the state.