

Weed flora of garlic in Haryana

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ABSTRACT

Ecological survey of weeds associated with garlic crop in Karnal, Ambala, Yamuna Nagar and Kurukshetra districts in north-eastern zone and Bhiwani and Hisar in south-western zone of Haryana state was conducted during two consecutive years in rabi 2006 and 2007. Among 17 known species spotted in garlic fields, 4 were grassy, 12 broad leaf weeds and only one sedge was recorded. *Cyperus rotundus*, *Anagallis arvensis*, *Chenopodium album*, *Melilotus indica*, *Coronopus didymus*, *Medicago denticulata* and *Spergula arvensis* among broad leaf weeds and *Phalaris minor*, *Poa annua* and *Polypogon monspiliensis* among grasses were the major weeds of garlic in all districts. In Karnal, Ambala and Hisar, *Anagallis arvensis* was the most dominant weed with a relative density (RD) of 18.1, 16.1 and 16.4%, respectively with 100% occurrence in all the three districts while in Kurukshetra, *Poa annua* dominated weed flora with 20.5% of total weed flora followed by *P. minor*, *A. arvensis* and *C. album* in Yamuna Nagar district. *P. minor* was the most dominant weed with RD of 19.6% where as in Bhiwani, *Chenopodium murale* was the most dominant weed of garlic. *Trigonella polycerata* a weed of light textured soils was found in loamy sand soils of Bhiwani district only.

Key words : Garlic, weed flora, *Chenopodium album*, *Anagallis arvensis*, *Chenopodium murale*, *Phalaris minor*, *Poa annua*

Garlic (*Allium sativum* L.) being used as condiment, is having great economic value. It is mainly grown as commercial crop in north-eastern districts of Haryana state. Recently in Bhiwani and Hisar districts, area under cultivation of garlic has picked up due to incentives provided under National Horticulture Mission. Its high yield potential, profitability, storability and export quality make it a lucrative cash crop. It is shallow rooted, closely spaced and requires frequent irrigations. Crop weed competition has been established as major deterrent for its low productivity. Frequent irrigations, sparse foliages, slow growth rate and planting at wider spacing provide congenial atmosphere for weeds to grow resulting in 71-85% decrease in seed yield depending upon weed flora and intensity (Porwal 1995). Crop type and soil properties had greatest influence on the occurrence of weed species (Streibig *et al.* 1984, Andreasen *et al.* 1991). The type of irrigation, cropping pattern, weed control measures and environmental factors had a significant influence on the intensity and infestation of weed (Saavedra *et al.* 1980). So, knowledge of weed species associated with crops in a region is pivotal and necessary to plan and execute a sound and economical weed management schedule depending upon various factors affecting weed distribution in different areas. The present survey was the first attempt to cover all garlic growing districts of Haryana state to study the composition of weed flora of garlic crop.

MATERIALS AND METHODS

To study the floristic composition of weeds in garlic in north-eastern and south-western Haryana, 68 fields were surveyed in Karnal, Kurukshetra, Ambala, Yamuna Nagar, Hisar, Bhiwani districts of state during December January 2006 and 2007 as this period depicted most appropriate representation of majority of weed species as the weeds have cumulative effects on all agronomic practices, soil type, fertilizer and irrigation application and weed control measures adopted during initial crop growing period. The road map of Haryana state was followed and routes were planned to establish sampling localities as equidistantly as possible (about 10 kms) avoiding inhabited areas. Four observations on density of individual weeds were recorded per field from four fields at one spot by using quadrates of (0.5 x 0.5 m), 100 meter deep inside the fields. Pooled average values of observations of weed density and per cent occurrence of individual weeds were thus calculated as per method suggested by Misra (1968) and Raju (1977) given below:

$$\text{Relative density} = \frac{\text{No. of individuals in all quadrates}}{\text{No. of all species in all quadrates}} \times 100$$

$$\% \text{ occurrence} = \frac{\text{No. of occurrences of a species in a district}}{\text{Total no. of observations recorded in a district}} \times 100$$

Table 1: Weed flora of garlic in Bhiwani and Hisar districts of Haryana state.

| Weed Species | Bhiwani | | Hisar | | Karnal | | Kurukshetra | | Ambala | | Yamuna Nagar | |
|--------------------------------|---------|--------------|---------|--------------|---------|--------------|-------------|--------------|---------|--------------|--------------|--------------|
| | R.D (%) | % occurrence | R.D (%) | % occurrence | R.D (%) | % occurrence | R.D (%) | % occurrence | R.D (%) | % occurrence | R.D (%) | % occurrence |
| <i>Phalaris minor</i> | 0 | 7 | 6.8 | 45 | 15.2 | 85 | 19.6 | 77 | 8.8 | 65 | 16.2 | 56 |
| <i>Avena ludoviciana</i> | 2.3 | 15 | 3.2 | 28 | 0.0 | 0 | 0.8 | 6 | 2.8 | 16 | 1.3 | 22 |
| <i>Chenopodium album</i> | 11.6 | 94 | 14.9 | 100 | 6.7 | 100 | 11.6 | 90 | 7.3 | 85 | 11.9 | 82 |
| <i>Melilotus indica</i> | 9.1 | 85 | 13.4 | 100 | 5.7 | 64 | 2.6 | 56 | 4.3 | 60 | 3.8 | 100 |
| <i>Anagallis arvensis</i> | 4.3 | 45 | 16.4 | 100 | 18.1 | 100 | 15.2 | 100 | 16.1 | 100 | 14.8 | 100 |
| <i>Spergula arvensis</i> | 6.1 | 68 | 6.9 | 46 | 6.0 | 40 | 2.6 | 56 | 8.1 | 32 | 2.8 | 23 |
| <i>Convolvulus arvensis</i> | 2.2 | 50 | 4.5 | 74 | 0.0 | 0 | 1.9 | 10 | 0 | 0 | 0 | 0 |
| <i>Medicago denticulata</i> | 3.0 | 26 | 2.6 | 48 | 8.2 | 100 | 9.3 | 77 | 8.7 | 100 | 15.9 | 82 |
| <i>Rumex dentatus</i> | 0.0 | 12 | 1.8 | 65 | 5.1 | 78 | 2.6 | 84 | 4.1 | 55 | 3.5 | 60 |
| <i>Rumex spinosus</i> | 4.7 | 68 | 0.6 | 16 | - | - | - | - | - | - | - | - |
| <i>Poa annua</i> | 5.7 | 26 | 9.6 | 46 | 16.5 | 94 | 20.5 | 100 | 12.7 | 65 | 14.5 | 74 |
| <i>Chenopodium murale</i> | 33.2 | 100 | 4.4 | 50 | - | - | - | - | - | - | - | - |
| <i>Coronopus didymus</i> | 2.3 | 18 | 6.3 | 84 | 3.5 | 100 | 5.3 | 84 | 7.8 | 10 | 7.7 | 82 |
| <i>Polypogon monspiliensis</i> | 0.0 | 7 | 2.0 | 60 | 7.1 | 85 | 2.4 | 50 | 8.7 | 49 | 2.7 | 60 |
| <i>Fumaria parviflora</i> | 6.5 | 74 | 1.0 | 45 | 0.6 | 15 | 1.0 | 10 | 3.1 | 26 | 1.5 | 20 |
| <i>Cyperus rotundus</i> | 3.8 | 26 | 5.8 | 82 | 7.3 | 76 | 4.5 | 81 | 7.4 | 60 | 3.5 | 68 |
| <i>Trigonella polycerata</i> | 5.2 | 22 | 0 | 0 | - | - | - | - | - | - | - | - |

RESULTS AND DISCUSSION

Seventeen weed species were found in the ecological survey of weeds in garlic crop throughout the state. Out of 17 weed species, 10 were found to be highly associated with this crop (Table 1). The weeds *Anagallis arvensis*, *Chenopodium album*, *Melilotus indica*, *Coronopus didymus*, *Medicago denticulata* and *Spergula arvensis* among broad leaf weeds; *Phalaris minor*, *Poa annua* and *Polypogon monspiliensis* among grasses and *Cyperus rotundus* among sedges were found to be dominating over other weed species present.

In Karnal, Ambala and Hisar, *Anagallis arvensis* was the most dominant weed with a relative density of 18.1, 16.1 and 16.4%, respectively with 100% occurrence in all the three districts while in Kurukshetra, *Poa annua* dominated with 20.5% of total weed flora followed by *Phalaris minor* and *Anagallis arvensis*. *C. album*, *Phalaris minor* was the most dominant weeds with R.D. of 19.6% in Kurukshetra district where as this weed did not show its presence in low fertility and low soil moisture holding capacity loamy sand soils of Bhiwani district. In north-eastern Haryana *Convolvulus arvensis*, a perennial climber was only present in Kurukshetra district with a mere density of 2.1 plants/m² occurring at 10% of sites surveyed while in south-western districts of Hisar and Bhiwani, although the density of this weed was 1.2 - 3.5 plants/m² but it showed its occurrence at 50-74% of sites surveyed in these two districts. *Chenopodium murale* was the most dominant weed of garlic in Bhiwani district constituting 33.2% of total weed flora. Brackish underground waters used for irrigation in Bhiwani and some parts of Hisar district may be reason for more prevalence of *C. murale* in these areas as this weed flourishes only under saline-sodic waters. *Trigonella polycerata* a weed of light textured soils was found in loamy sand soils of Bhiwani district only. *Spergula*

arvensis was among five major weeds infesting garlic crop in Bhiwani and Hisar districts. *Poa annua*, *Medicago denticulata*, *Coronopus didymus* and *P. minor* weeds found in higher moisture conditions, had more infestation and relative frequency in north-eastern districts as compared to south-western districts where as density of *A.ludoviciana* was more in Bhiwani and Hisar. Similarly another moisture loving weed *Polypogon monspiliensis* was present in all the districts except Bhiwani. Greater soil moisture, heavy soils with high fertility and frequent irrigation seemed to contribute the dominance of these weeds in Karnal, Ambala, Kurukshetra and Yamuna Nagar districts. Density and frequency of broadleaf weed *Fumaria parviflora* of light textured soil was more in southern districts as compared to north-eastern Haryana.

The data clearly show that the occurrence of weed species could directly be correlated to the soil type of fertility status quality under ground water, cropping patterns and agronomic practices followed in that area. Careful monitoring of the changing weed flora could be of much practical value in implementing an effective control measure depending upon the threshold value to keep the weeds at bay at an economical viable cost.

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