

A Phyto-sociological Association of Weeds in Winter Crops of Kashmir Valley

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ABSTRACT

The study on phyto-sociological association of weeds in winter crops viz., brown sarson (*Brassica campestris* L.), oat and wheat (*Triticum aestivum* L.) of Kashmir valley was conducted during 2000-01 and 2001-02 at varying altitudes from 1500 to 2000 MSL. Maximum IVI of *Poa annua* was noticed in brown sarson (throughout valley) and oat (only in higher belts >1700 MSL). At lower and mid altitudes in oat fields and at high altitudes in wheat fields *Ranunculus* spp. recorded maximum IVI. Wheat fields (above 1600 MSL) showed maximum IVI of *Capsella bursa-pastoris*.

INTRODUCTION

Kashmir valley is located at 73°45'–75°35' E longitude and 32°25'–34°55' N latitude with 400 lakh hectares of land under different crops. The productivity of main winter crops like brown sarson (*Brassica campestris* L.) and wheat (*Triticum aestivum* L.) is low due to various production constraints. Weed infestation is one of the factors responsible for low productivity. Due to severe cold, **rabi** crops in Kashmir valley which have typical temperate climate, take more than eight months to complete the life cycle. During winter months, average temperature varies between -5.8°C to 31.1°C. Most of the annual precipitation is received during this period due to western disturbances.

Crops are sown in the month of October. Most of the weeds germinate alongwith crops and thrive cold months. Thus, weed association with crops is also of long duration and crops are subjected to competition from weeds for a longer period. Knowledge of weed flora, population and distribution is prerequisite to formulate economic and effective weed control strategy. Little information is available on crop weeds, however, some information on weeds is available in terms of taxonomical aspects (Sapru and Raina, 1983; Siddiqi *et al.*, 1985; Reshi *et al.*, 1986; Shoukat Ara *et al.*, 1995). Thus, an attempt was made to survey weed flora associated with **rabi** crops in Kashmir valley at varying altitudes ranging from 1500 to 2000 MSL.

MATERIALS AND METHODS

Crop-weed association survey was taken up in

different zones based on altitude within the valley of Kashmir, which can be broadly divided into three zones i. e. Zone I Lower belt of valley (1550-1600 MSL), Zone II mid altitude (1600-1700 MSL) and Zone III high belts (>1700 MSL). The observations were taken from crop fields from each zone, alongwith the roads at every 10 kilometre distance, 100-200 m away from the road to eliminate the effect of road and trees on natural growth of weeds in association with the crops. Species-wise weed count was recorded using quadrates of 50 x 50 cm size. Three quadrants were taken randomly in the field. Average of 15 fields was taken from each crop from each zone. Weeds at bunds and surrounding areas were not considered, as weed flora directly associated with crops between late tillering stages to flowering was recorded. The survey was concluded during the spring months of 2000 and 2001. The data were analyzed for quantitative and qualitative studies using the formulae :

$$\text{Density} = \frac{\text{Total number of individuals of a species}}{\text{Quadrants studied}}$$

$$\text{Dominance} = \frac{\text{Total number of individuals of a species}}{\text{Quadrants of occurrence}}$$

$$\text{Frequency (\%)} = \frac{\text{Quadrants of occurrence}}{\text{Quadrants studied}}$$

Relative density, relative dominance and relative frequency values for each individual species were added to get importance value indices (Risser and Rice, 1971).

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RESULTS AND DISCUSSION

Oat (*Avena sativa* L.) as fodder crop and brown sarson (*Brassica campestris* L.) were observed cultivated followed by rice as a common double cropping system comprising about 50% of the area under the sites surveyed in all the zones. Wheat was also cultivated as rainfed crop across the valley in all the three zones, but in a limited area. Herbicide application was not used by farmers anywhere to any crop under the study. Even manual weeding was observed only at a few sites.

Among weed species recorded the most common grasses were *Cynodon dactylon*, *Lolium perenne*, *Poa angustifolia*, *Poa annua* and *Poa bulbosa*.

The most common broad-leaved weed species were *Arenaria serpyllifolia*, *Stellaria media*, *Ranunculus muricatus*, *R. arvensis*, *Polygonum aviculare*, *P. hydropiper*, *Plantago lanceolata*, *Vicia sativa*, *Rorippa sylvestris*, *Conyza canadensis*, *Fumaria indica*, *Capsella bursa-pastoris* and *Papaver dubium*. No sedges were observed in the samples collected in any crop across the valley.

Weed Associated with Brown Sarson

The survey revealed that 28, 21 and 12 weed species were observed associated with brown sarson in the Zones I, II and III, respectively, indicating that a

Table 1. Relative density, relative frequency, relative dominance and importance value index of weeds associated with brown sarson (*Brassica campestris*)

Scientific name	Zone I 1550-1600 MSL				Zone II 1600-1700 MSL				Zone III >1700 MSL			
	R De	R Fe	R Do	IVI	R De	R Fe	R Do	IVI	R De	R Fe	R Do	IVI
<i>Anagallis arvensis</i>	1.0	2.7	1.7	5.4	3.5	2.9	6.2	12.5	-	-	-	-
<i>Arenaria serpyllifolia</i>	15.9	9.3	8.1	33.3	16.6	14.3	5.9	36.8	3.8	8.7	4.3	16.8
<i>Cannabis sativa</i>	2.5	1.3	8.8	12.6	-	-	-	-	-	-	-	-
<i>Capsella bursa-pastoris</i>	0.3	1.3	1.1	2.7	-	-	-	-	-	-	-	-
<i>Chenopodium album</i>	0.3	1.3	1.1	2.7	-	-	-	-	-	-	-	-
<i>Convolvulus arvensis</i>	2.3	4.0	2.8	9.1	-	-	-	-	-	-	-	-
<i>Crepis sancta ssp. bifida</i>	2.5	1.3	8.8	12.6	-	-	-	-	-	-	-	-
<i>Cynodon dactylon</i>	0.3	1.3	1.1	2.7	2.9	2.9	5.2	11.0	-	-	-	-
<i>Descurainia sophia</i>	0.2	1.3	0.6	2.0	0.5	2.9	1.0	4.4	-	-	-	-
<i>Conyza canadensis</i>	-	-	-	0.0	2.6	2.9	4.6	10.1	2.0	17.4	1.1	20.5
<i>Euphorbia hispidula</i>	1.1	2.7	1.9	5.7	0.4	2.9	0.8	4.1	-	-	-	-
<i>Fumaria indica</i>	3.4	4.0	4.0	11.4	-	-	-	-	-	-	-	-
<i>Geranium nepalense</i>	1.1	2.7	1.9	5.7	1.3	2.9	2.3	6.5	-	-	-	-
<i>Gnaphalium luteo- album</i>	0.2	1.3	0.6	2.0	0.4	2.9	0.8	4.1	2.9	8.7	3.2	14.7
<i>Lens culinaris</i>	-	-	-	0.0	0.4	2.9	0.8	4.1	-	-	-	-
<i>Lolium perenne</i>	0.8	1.3	2.8	4.9	0.5	2.9	1.0	4.4	-	-	-	-
<i>Matricaria chamomilla</i>	0.3	1.3	1.1	2.7	-	-	-	-	-	-	-	-
<i>Phleum himalicum</i>	2.3	2.7	4.1	9.1	1.0	5.7	0.9	7.6	-	-	-	-
<i>Plantago lanceolata</i>	0.3	1.3	1.1	2.7	6.4	2.9	11.4	20.6	0.5	4.3	1.1	5.9
<i>Poa angustifolia</i>	1.7	4.0	2.0	7.6	9.3	8.6	5.5	23.4	1.0	4.3	2.1	7.4
<i>Poa annua</i>	27.8	13.3	9.8	51.0	18.5	5.7	16.5	40.8	46.4	13.0	34.5	93.9
<i>Poa bulbosa</i>	1.4	1.3	5.0	7.7	-	-	-	-	-	-	-	-
<i>Polygonum aviculare</i>	2.0	5.3	1.8	9.1	0.4	2.9	0.8	4.1	1.4	8.7	1.6	11.7
<i>Polygonum hydropiper</i>	4.5	9.3	2.3	16.1	7.3	11.4	3.2	21.9	30.2	8.7	33.6	72.5
<i>Ranunculus arvensis</i>	4.7	4.0	5.5	14.2	11.3	2.9	20.1	34.2	5.1	4.3	11.4	20.9
<i>Ranunculus muricatus</i>	5.1	2.7	9.0	16.8	-	-	-	-	-	-	-	-
<i>Rorippa sylvestris</i>	1.4	4.0	1.7	7.1	1.1	2.9	1.9	5.9	5.4	13.0	4.0	22.4
<i>Stellaria media</i>	13.8	10.7	6.1	30.5	6.4	5.7	5.7	17.8	1.0	4.3	2.1	7.4
<i>Veronica persica</i>	2.7	2.7	4.7	10.1	0.1	2.9	0.2	3.2	-	-	-	-
<i>Vicia sativa</i>	0.2	1.3	0.7	2.2	8.9	8.6	5.3	22.7	0.5	4.3	1.1	5.9

R De–Relative density, R Fe–Relative frequency, R Do–Relative dominance, IVI–Importance value index.

Table 2. Relative density, relative frequency, relative dominance and importance value index of weeds associated with oat (*Avena sativa*)

Scientific name	Zone I (1550-1600 MSL)				Zone II (1600-1700 MSL)				Zone III (>1700 MSL)			
	R De	R Fe	R Do	IVI	R De	R Fe	R Do	IVI	R De	R Fe	R Do	IVI
<i>Anagallis arvensis</i>	-	-	-	-	12.0	2.0	16.7	30.7	-	-	-	-
<i>Arenaria serpyllifolia</i>	6.9	8.2	3.1	18.2	19.2	12.9	9.7	41.8	8.0	6.7	13.8	28.5
<i>Cannabis sativa</i>	0.2	1.6	0.5	2.4	-	-	-	-	-	-	-	-
<i>Capsella bursa-pastoris</i>	3.1	1.6	6.9	11.6	-	-	-	-	-	-	-	-
<i>Chenopodium album</i>	1.3	3.3	1.4	6.0	1.8	3.2	3.6	8.7	-	-	-	-
<i>Convolvulus arvensis</i>	1.1	1.6	2.5	5.2	2.4	3.2	4.8	10.5	-	-	-	-
<i>Crepis sancta ssp. bifida</i>	0.3	1.6	0.6	2.5	-	-	-	-	-	-	-	-
<i>Descurainia sophia</i>	5.7	3.3	6.4	15.4	0.6	3.2	1.2	5.0	6.7	6.7	11.6	25.0
<i>Echinochloa crus-galli</i>	0.3	1.6	0.6	2.5	2.4	3.2	4.8	10.5	-	-	-	-
<i>Conyza canadensis</i>	1.0	4.9	0.8	6.7	4.8	6.4	4.8	16.1	4.4	6.7	7.5	18.6
<i>Euphorbia hispida</i>	1.5	3.3	1.7	6.5	5.4	3.2	10.9	19.5	-	-	-	-
<i>Fumaria indica</i>	6.6	1.6	14.8	23	-	-	-	-	-	-	-	-
<i>Geranium nepalensis</i>	0.9	1.6	2.0	4.5	-	-	-	-	-	-	-	-
<i>Gnaphalium luteo-album</i>	-	-	-	-	-	-	-	-	2.2	13.3	1.9	17.4
<i>Lens culinaris</i>	0.2	1.6	0.5	2.4	-	-	-	-	-	-	-	-
<i>Lolium perenne</i>	4.6	3.3	5.2	13.1	-	-	-	-	-	-	-	-
<i>Matricaria chamomilla</i>	0.9	3.3	1.0	5.1	-	-	-	-	-	-	-	-
<i>Phleum himalicum</i>	-	-	-	-	0.8	3.2	1.5	5.5	-	-	-	-
<i>Plantago lanceolata</i>	-	-	-	-	-	-	-	-	0.9	6.7	1.6	9.1
<i>Poa angustifolia</i>	0.4	1.6	1.0	3.1	-	-	-	-	5.8	6.7	10.1	22.5
<i>Poa annua</i>	11.4	9.8	4.3	25.6	6.3	9.7	4.2	20.2	41.0	13.3	35.5	89.9
<i>Polygonum aviculare</i>	0.4	1.6	1.0	3.1	10.5	9.7	7.1	27.3	3.8	20.0	2.2	26.0
<i>Polygonum hydropiper</i>	12.3	9.8	4.6	26.8	5.6	12.9	2.8	21.3	27.2	20.0	15.7	62.9
<i>Polygonum lapathifolium</i>	3.1	3.3	3.5	9.9	1.8	3.2	3.6	8.7	-	-	-	-
<i>Ranunculus muricatus</i>	10.3	1.6	23.2	35.1	3.0	3.2	6.1	12.3	-	-	-	-
<i>Ranunculus arvensis</i>	16.2	8.2	7.2	31.6	19.2	6.4	19.4	45.1	-	-	-	-
<i>Rorippa sylvestris</i>	3.8	6.6	2.1	12.5	-	-	-	-	-	-	-	-
<i>Stellaria media</i>	0.2	1.6	0.5	2.4	3.0	6.4	3.0	12.5	-	-	-	-
<i>Taraxicum officinale</i>	-	-	-	-	0.6	3.2	1.2	5.0	-	-	-	-
<i>Trifolium repens</i>	0.5	3.3	0.6	4.3	-	-	-	-	-	-	-	-
<i>Veronica persica</i>	3.7	6.6	2.1	12.4	3.6	3.2	7.3	14.1	-	-	-	-
<i>Vicia sativa</i>	1.9	3.3	2.2	7.4	5.7	9.7	3.8	19.2	-	-	-	-

lower belts (Zone I) broad spectrum of weeds were recorded than higher belt due to better growth conditions for both weeds and crops as higher belts even under temperate conditions are subjected to more restricted growth period (Table 1). In all the three zones, *P. annua* exhibited maximum importance value (IVI), which was 51.0 in zone I, 40.8 in zone II and exceedingly high value of 93.9 in zone III. In zone I, *P. annua* was followed by *A. serpyllifolia* (33.3), *S. media* (30.5), *R. muricatus* (16.8), *Polygonum hydropiper* (16.1), *R. arvensis* (14.2) and *V. persica* with greater than an IVI value of 10. In zone II, *P. annua* followed by *A. serpyllifolia* (36.8), *R. arvensis* (34.2), *P. angustifolia* (23.4), *V. sativa* (22.7), *P. hydropiper* (21.9), *P. lanceolata* (20.6) and *S. media* (17.8). In zone III, *P. annua* was followed by *P. hydropiper* (72.5), *R. sylvestris* (22.4), *R. arvensis* (20.9)

and *C. canadensis* (20.5).

Weeds Associated with Fodder Oat

In zones I, II and III, 27, 19 and 9 weed species were found associated with oat fodder cop, respectively (Table 2). In zone I, *R. muricatus* exhibited maximum importance value index (IVI) of 35.1, followed by *R. arvensis* (31.6), *F. indica* (23.0) and *A. serpyllifolia* (18.2). In zone II, *R. arvensis* recorded maximum value of IVI (45.1), followed by *A. serpyllifolia* (31.3) and *P. annua* (20.2). Whereas in zone III, *P. annua* exhibited maximum IVI (89.9) followed by *P. hydropiper* (62.9), *A. serpyllifolia* (28.3), *P. aviculare* (26.0), *Descurainia sophia* (25.0) and *P. angustifolia* (22.5). *R. arvensis*, *R. muricatus*, *F. indica*, *A. serpyllifolia* and *P. annua*

Table 3. Relative density, relative frequency, relative dominance and importance value index of weeds associated with wheat (*Triticum eastivum*)

Scientific name	Zone I (1550-1600 MSL)				Zone II (1600-1700 MSL)				Zone III (>1700 MSL)			
	R De	R Fe	R Do	IVI	R De	R Fe	R Do	IVI	R De	R Fe	R Do	IVI
<i>Arenaria serpyllifolia</i>	-	-	-	-	29.4	11.5	18.1	59.1	-	-	-	-
<i>Capsella bursa-pastoris</i>	23.4	9.1	25.9	58.4	4.6	11.5	2.8	19.0	-	-	-	-
<i>Chenopodium album</i>	-	-	-	-	-	-	-	-	1.0	9.1	1.7	11.8
<i>Convolvulus arvensis</i>	15.6	9.1	17.2	41.9	3.0	3.8	5.6	12.4	-	-	-	-
<i>Descurania sophia</i>	6.3	9.1	6.90	22.2	19.1	7.7	17.7	44.4	-	-	-	-
<i>Fumaria indica</i>	17.2	9.1	19.0	45.2	3.0	7.7	2.8	13.5	-	-	-	-
<i>Gnaphalium luteo- album</i>	-	-	-	-	2.3	3.8	4.2	10.4	-	-	-	-
<i>Matricaria chamomilla</i>	1.6	9.1	1.72	12.4	-	-	-	-	-	-	-	-
<i>Papaver dubium</i>	-	-	-	-	15.2	7.7	14.1	37.0	13.0	18.2	10.5	41.7
<i>Phleum himalicum</i>	1.6	9.1	1.72	12.4	-	-	-	-	-	-	-	-
<i>Poa angustifolia</i>	-	-	-	-	2.9	3.8	5.3	12.0	-	-	-	-
<i>Poa annua</i>	-	-	-	-	-	-	-	-	20.0	9.1	31.4	60.1
<i>Poa bulbosa</i>	-	-	-	-	0.6	3.8	1.1	5.5	-	-	-	-
<i>Polygonum aviculare</i>	15.6	9.1	17.2	41.9	0.7	3.8	1.3	5.9	2.9	9.1	4.6	16.6
<i>Polygonum hydropiper</i>	-	-	-	-	2.3	3.8	4.2	10.4	0.5	9.1	0.8	10.5
<i>Polygonum lapathifolium</i>	-	-	-	-	1.7	3.8	3.2	8.8	-	-	-	-
<i>Ranunculus arvensis</i>	-	-	-	-	4.6	7.7	4.2	16.5	60.0	18.2	48.1	126.5
<i>Ranunculus muricatus</i>	-	-	-	-	1.4	3.8	2.7	7.9	-	-	-	-
<i>Stellaria media</i>	12.5	18.2	6.9	37.6	4.7	7.7	4.4	16.8	1.6	18.2	1.3	21.0
<i>Trifolium repens</i>	-	-	-	-	-	-	-	-	1.0	9.1	1.7	11.8
<i>Veronica persica</i>	6.3	18.2	3.45	27.9	1.6	3.8	2.9	8.3	-	-	-	-
<i>Vicia sativa</i>	-	-	-	-	2.9	3.8	5.3	12.0	-	-	-	-

have been reported from oat fields of Kashmir (Reshi et al., 1986). *A. serpyllifolia* was highly frequent (50%).

Weeds Associated with Wheat

Area under wheat crop is only 1600 hectares in Kashmir valley, however, its production potential is high because of most congenial climatic conditions. In zones I, II and III, more frequently 9, 17 and 8 weed species were observed, respectively (Table 3). Koul (1986) reported highest frequency of *Papaver dubium* (65%) followed by *Descurainia sophia* (62%) and *R. arvensis* (40%) in the wheat fields of Kashmir. However, present survey revealed association of *C. bursa-pastoris* with a maximum IVI of 58.4, followed by *F. indica* (45.2) in zone I. In zone II, *A. serpyllifolia* (59.1) was followed by *P. aviculare* (41.9), *D. sophia* (44.4) and *P. dubium* (37.0). In zone III, highest IVI value was observed for *R. arvensis* (126.5), followed by *P. annua* (60.1), *P. dubium* (41.7) and *S. media* (21.0).

Thus, brown sarson was found severely infested by *P. annua* and *A. serpyllifolia* at varying altitudes. Fodder oats recorded association of weeds

like *R. spp.*, *A. serpyllifolia* and *F. indica* at lower and mid altitudes but at higher altitudes *P. annua* predominated. *C. bursa-pastoris* and *F. indica* were observed at lower elevations. Where at mid altitude *A. serpyllifolia* and *D. sophia* were predominant and at higher altitude *R. arvensis* and *P. annua* dominated the weed flora.

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