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STUDY OF WEEDS PROBLEM IN WHEAT GERMPLASM GROWN AT NBPGR

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Abstract: A phytosociological survey of weeds was conducted during 2014-15 and 2015-16 to check the severity of competition in wheat crop in New Delhi. A total of 20 weed species belonging to 18 genera and 11 families were recorded from the area under investigation. Two weed communities viz., *Phalaris-Emex-Avena* in Issapur and *Phalaris-Chenopodium-Avena* in Post Entry Quarantine Nursery (PEQN) were determined during this period. The dominant weed species among these communities were *Avena fatua, Chenopodium album, Cirsium arvense, Melilotus indica* and *Emex australis*. *Phalaris minor* was found as the most dominant and frequent weed species with IVI of 52.25 and frequency percentage of 87. The other weeds like *Asphodelus tenuifolius*, *Chenopodium murale, Cynodon dactylon, Cyperus rotundus, Lathyrus aphaca* and *Emex australis* were frequent (F) with frequency percentage ranging from 42-58. *Emex australis* is proposed as a new emerging weed in wheat crop in the study area. This weed species has not been reported earlier as a weed in wheat crop.
Keywords: Germplasm, importance value index, PEQN, wheat, weeds.

Introduction

Plant genetic resources are the important components of the agro-biodiversity and play an important role in sustaining and strengthening the food and nutritional security. A thorough evaluation of all indigenously collected as well as introduced germplasm is an essential pre-requisite for its utilization in crop improvement. The ICAR-National Bureau of Plant Genetic Resources has taken responsibility for characterization, evaluation and maintenance of wheat germplasm. Weed intervention is one of the most important constraints causing low yield of wheat in India. Weeds compete with the crop plants for nutrients, moisture, light, CO_2 and space, whereas many weeds also possess allelopathic effects against crops and loss caused by weeds to the crop is significant (Singh et al., 2018). The yield reduction due to weeds could be 15 to 25% in wheat grain depending upon the type and intensity of weeds in wheat (Brar and Walia, 1989). Due to weed infestation, potential yield loss of 16.5–43.0% and actual yield loss to the tune of 7.5–41.0% were observed in the farmers' fields (Gharde et al., 2018). Among the major biotic constraints, weeds are considered as the most harmful to agricultural production besides affecting agrobiodiversity and natural water bodies. They also affect the crop production indirectly, by competing with the crop for resources, sheltering crop pests,

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interfering with water management, reducing the yield and quality, and subsequently increasing the cost of processing (Zimdahl, 2013). They further stated that besides contaminating crop seeds, weeds provide habitat for harmful insects and organisms and may also act as alternate hosts for pathogens and other organism. Some of the weeds may be poisonous to livestock. The seeds of weeds may remain dormant and viable for 30-40 years and hard seed coat of the seed can resist adverse climate, diseases and soil conditions (Oudejan, 1994). Weeds form a cover over the soil surface in crop fields as well as in non-cropped fallow and wastelands. Assessment of weed cover is an important and essential aspect of weed management. Appraisal of certain phyto-sociological parameters or quantitative characteristics such as frequency, density, abundance and dominance of a species using quadrats or other means provides information on the relative importance of a weed species through importance value index (IVI).

Keeping in view the importance of weeds, this study was conducted in Delhi in order to record level of weed infestation in wheat crop of the area. Present study reports the current status of weed species that is their identification, distribution, association and constancy. The information about weed communities and their associations resulted from analytical values like density, frequency and cover will be helpful for recognizing the severity of weed infestation in the wheat crop and weed competition in the area under investigation.

Materials and Methods

A total of 4302 wheat germplasm lines comprising international trials (3122 entries), exotic germplasm (1129 accessions) and registered germplasm (51 lines) were grown in Post Entry Quarantine Nursery, 2919 accessions were grown for characterization and evaluation, 1038 referral samples for regeneration and 1900 accessions were grown for species identification at Issapur farm.

Both wheat germplasm growing site viz., Issapur farm and Post Entry Quarantine Nursery (PEQN) in New Delhi were surveyed during 2014-15 and 2015-16. The soil of the experimental plot was sandy loam in texture having organic carbon 0.7%, available N 297.6 kg/ha, available P 26.7 kg/ha and available K 196.0 kg/ha with soil pH of 6.5. The crop was sown on 16th and 18th November in 2014 and 2015, respectively and recommended package of practices were followed for raising the crop. Weed species were identified with the help of available literature by consulting identification keys. Each study site was measured 100 m by 100 m. Fifty quadrates each measuring 1 m^2 size were randomly placed in each site and the weed species inside each quadrate were observed, identified and recorded. Relative density,

frequency and cover were computed to obtain Importance Value Index (IVI). Importance Value Index (IVI) was calculated by summing up the values of relative density, relative dominance and relative frequency (Sharma *et al*., 2009). Each weed community was named based on highest IVI with the first three dominants. Based on frequency percentage, weed species were classified into Rare (1-20%), Occasional (21-40%), Frequent (41-60%), Abundant (61-80%) and Very Abundant (81-100%).

Results and Discussion

During the survey, 20 weed species belonging to 18 genera and 11 families were recorded. The major families which contributed to the weed flora of wheat crop were Fabaceae (4), Poaceae (3), Asteraceae (3), Chenopodiaceae (2) and Polygonaceae (2). Two weed communities viz., *Phalaris-Emex-Avena* in Issapur and *Phalaris-Chenopodium-Avena* in PEQN were determined (Table 1). Based on IVI, the dominant weed species among these communities were *Avena fatua, Chenopodium album, Cirsium arvense, Melilotus indica* and *Emex australis*. *Phalaris minor* was found as the most dominant and frequent weed species with IVI of 52.25 and frequency percentage of 87 (Table 1). The dominance of the determined communities was more or less same in both sites. This could be due to similar nature of soils and climatic conditions of both areas. *Phalaris minor* and *Melilotus indica* were observed very widespread species infesting the whole study area. These weed species showed highest frequency percentage and placed in Very Abundant (VA) class. Whereas, three species such as *Avena fatua, Chenopodium album* and *Convolvulus arvensis* were marked as Abundant (A) in the area with the frequency percentage ranging from 61-79. The other weeds like *Asphodelus tenuifolius*, *Chenopodium murale, Cynodon dactylon, Cyperus rotundus, Lathyrus aphaca* and *Emex australis* were frequent (F) with frequency percentage ranging from 42-58. Weed species with high IVI and frequency might exert competition to reduce growth and yield of associated crop. However, weeds with less IVI cannot be underestimated in their importance due to possible allelopathic effects on cultivated crop (Hussain, 1983). The losses caused to agricultural crops by noxious weeds like *Avena fatua, Chenopodium album* and *Cyperus rotundus* are significant. It has been reported that increasing the density of *Phalaris minor* to 200 plants m^2 decreased the grain yield of wheat by 36% (Anon., 1992). In spite of their negative impact on yield, weeds have been used by local people for various purposes. For example *Anagalis arvensis*, *Avena fatua, Chenopodium album* and *Phalaris minor* are extensively exploited as fodder for livestock. *Chenopodium album* is cooked as vegetable.

Conclusion

The present study suggests that a variety of weeds are infesting the wheat crop quite heavily in New Delhi. The identified weed communities may cause great losses to yield of wheat crop. For acquiring the better yield, it is necessary to take appropriate measures including cultural, mechanical, biological and chemical for their control. This information regarding weed biology can be helpful for the selection of weed control methods.

Table 1. Weed species, their IVI and constancy of weeds of wheat crop (Mean of two years)

Weed species	Family	IVI/Site/Community		Constancy
		PEQN	Issapur	
Anagalis arvensis L.	Primulaceae	3.10	3.72	38
Asphodelus tenuifolius Cavan.	Liliaceae	10.24	3.50	42
Avena fatua L.	Poaceae	34.57	31.60	79
Chenopodium album L.	Chenopodiaceae	32.15	16.65	61
Chenopodium murale L.	Chenopodiaceae	6.98	6.75	48
Cirsium arvense (L.) Scope.	Asteraceae	25.85	24.15	36
Convolvulus arvensis L.	Convolvulaceae	14.50	13.21	62
Cynodon dactylon (L.) Pers.	Poaceae	14.48	12.30	58
Cyperous rotundus L.	Cyperaceae	8.08	6.70	45
Fumaria indica (Haussk) Pugsely.	Fumariaceae	5.45	4.57	18
Lathyrus aphaca L.	Fabaceae	6.56	6.75	52
Launaea procumbens (Roxb.)	Asteraceae	4.45	6.53	14
Melilotus alba Medik.	Fabaceae	8.56	7.76	05
Melilotus indica (L.) All.	Fabaceae	23.65	30.65	81
Phalaris minor Retz.	Poaceae	52.25	51.75	87
Polygonum plebejum R. Br.	Polygonaceae	15.54	14.95	17
Emex australis Steinh.	Polygonaceae	15.25	36.80	52
Solanum nigrumi L.	Solanaceae	4.56	3.25	25
Sonchus asper (L.) Hill.	Asteraceae	4.87	4.52	16
Vicia hirsuta (L.) S.F. Gray.	Fabaceae	4.35	5.45	20

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