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FIELD STUDY ON WEEDS INCIDENCE IN RAPESEED (*BRASSICA CAMPESTRIS* L.)

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Abstract

A survey was conducted to highlight the weed flora infesting rapeseed in the experimental field of Rajshahi University. Frequency (F), density (D), abundance (A), relative frequency (RF), relative density (RD), relative abundance (RA) and importance value index (IVI %) of weeds were calculated in rapeseed field. The objective of the study was to study the weeds and their quantitative characters. Weed infestation was studied in three rapeseed varieties (BARI Sharisha 14, BINA Sharisha 5 and 6). The weed population was studied using quadrat. The species which had 100% frequency values were *Cyperus rotundus*, *Cynodon dactylon*, *Ammania baccifera*, *Echinochloa crusgalli* and *Leucas lavendulifolia*. Other species had 50% or less than 50% frequency values. The highest frequency, density, abundance and importance value index were exhibited by *Cyperus rotundus*.

Key words: Abundance, Density, Frequency, Rapeseed, Weed survey

Introduction

Rapeseed belonging to the family Brassicaceae is one of the important oilseed crops and currently ranked as the world's third import oil crop in terms of production and area (Rashid et al. 2007). Rapeseed is in the top of the list in respect of area and production compared to oilseed crops cultivated in Bangladesh (MoA 2006). It is well known that weeds interfere with crop plants, causing serious impacts either in the competition for light, water, nutrients and space or in the allelopathy (Zare et al. 2012). Rapeseed as a slowly growing crop is particularly exposed to severe competition from weeds. Weed suppression by shading only begins after the canopy of rapeseed leaves have grown over the rows and covered the field early. Faster growth of weeds is disadvantageous for light and hence photosynthesis needed for rapeseed plants (Zare et al. 2012). In addition, weeds development with rapeseed plant causes severe nutrition deprivation (Roshdy et al. 2008).

Survey is the key to identify the major and prevalent weeds in the rapeseed field. Weed surveys are useful for determining the occurrence and relative importance of weed species in crop production system (Frick and Thomas 1992, McCully et al. 1991, Thomas 1985). Rapeseed field management is one of the essential aspects for the agricultural development of a country for sustainable rapeseed production. Weeds are serious pests for rapeseed. Weeds are the cause of serious yield reduction problems in rapeseed production worldwide. Losses caused by weeds vary from one location to another, depending on the predominant weed flora and on the control methods practiced by farmers. A crop loss due to weed competition varies with the duration of weed infestation of the crop. Weeds commonly absorb added nutrients as much and more rapidly than crops (Moody 1990). Based on this information, a survey study on weed incidence rapeseed field was done.

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Materials and Methods

The experiment was carried out at the experimental field of Rajshahi University Campus (Agro-Ecological Zone 11), Bangladesh (24°75′ N latitude and 90°50′ E longitude) during the period from October 2008 to March 2009 during the growing seasons. The soil type was silty loam, having pH 7.5 and 35% of field capacity.

The experiment was laid out in a split plot design with three replications. Each replicated field was divided into three main plots for weed infestation study. Each main plot was divided into three sub-plots for varieties of rapeseed. Each plot size was 4 m × 3 m, i.e., 12 m^2 having a plot to plot distance 1 m to the North-South 2 m to the East-West; replication to replication distance 2 m, row to row 30 cm, and plant to plant 10 cm approximately.

To study the weed species growing in rapeseed field, a list-count quadrate (40 cm × 40 cm) was placed at random in the plot of each block and in this way 30 quadrats were taken from all plots. The plant species falling in each quadrat were recorded and in this way a phyto-sociological data were prepared. To have a clear picture of weed community in quantitative terms, the following parameters were analyzed (Ashby 1961, Ambasht 1974, Shukla and Chandel 1985):

$$\text{Frequency (F)} = \frac{\text{No. of quadrats in which the species occured}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density (D)} = \frac{\text{Total number of individuals of the species in all the quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance (A)} = \frac{\text{Total no. of individuals of the species in all the quadrats}}{\text{Total number of quadrats in which the species present}}$$

$$\text{Relative frequency (RF)} = \frac{\text{Freuency of the species}}{\text{Total frequency of all the species}} \times 100$$

$$\text{Relative density (RD)} = \frac{\text{Density of the species}}{\text{Total density of all the species}} \times 100$$

$$\text{Relative abundance (RA)} = \frac{\text{Abundance of the species}}{\text{Total abundance of all the species}} \times 100$$

$$\text{Importance value index (IVI \%)} = \frac{\text{RD} + \text{RF} + \text{RA}}{3}$$

Results and Discussion

A total of 18 weed species occurred in different treatments of rapeseed field. Among them, 14 species belong to dicotyledons, 3 monocotyledons and 1 pteridophytes.

Study of weeds and their quantitative characters

Study of weed species was done at 80 DAS. A total of 18 weed species were found in the three treatments. Detailed accounts of different weed species are given below:

Quantitative characters of the weed species of the no weeding treatment

Name of the weed species found in different weeding treatment together with their quantitative characters are shown Table 1 where a total of 15 weed species were identified.

Occurrence of weed species in different quadrats

Table 1 shows that *Cyperus rotundus*, *Ammania baccifera*, *Cynodon dactylon* and 11 *Echinochloa crusgalli* were present in all the 30 quadrats. *Desmodium triflorum* was found to occur in 27 quadrats. Species *Leucus lavendulifolia*, *Vicica sativa* and 10 *Mecardonia procumbens* were obtained in 24 quadrats. Species *Oxalis corniculata* and *Euphorbia hirta* occurred in 21 quadrats, *Chenopodium album* in 18 quadrats, *Phyllanthus niruri* in 15 quadrats and *Aerva sanguinolenta* in 9 quadrats. *Alternanthera sessilis* and *Marsilea quadrifolia* were present in 12 quadrats.

Individual species

The highest total number (621) of individual species was found in *Cyperus rotundus* followed by other species (Table 1). Ahmed et al. (1999) found that two weeding treatments produced the lowest total weed population whereas no weeding treatment had the highest weed population in Aus rice.

Frequency (F)

In Table 1 among the 15 species, *Cyperus rotundus*, *Ammania baccifera*, *Cynodon dactylon*, *Echinochloa crusgalli* occurred in all the quadrats and had 100% frequency. So these were the dominant species in the rapeseed plots. The species next came into prominence was found in *Desmodium triflorum* (90% frequency). *Leucas lavendulifolia, Vicia sativa, Mecardonia procumbens* all had 80% frequency values. *Oxalis corniculata* and *Euphorbia hirta* both had 70% and *Phyllanthus niruri* showed 50% frequency values. In this case *Alternanthera sessilis, Marsilea quadrifolia* and *Aerva sanguinolenta* showed less than 50% frequency values. The species which had 100% frequency values were *Cyperus rotundus*, *Cynodon dactylon*, *Ammania baccifera*, *Echinochloa crusgalli* and *Leucas lavendulifolia*. Other species had 50% or less than 50% frequency values. According to BARI report (2003), the major weed species in the mustard field were *Cynodon dactylon*, *Paspalum commersonii*, *Cyperus rotundus*, *Paspalum istichum* and *Digitaria sanguinaliyh*. Mondal et al. (1993) found that *Cyperus rotundus* L. covers more than 80%, *Cynodon dactylon* L. 14% and *Echinochloa colona* L. Beauv 6% in the cotton field. Nag et al. (1998) found that *Cynodon dactylon* was the most dominant (27.78%) weed species in mungbean followed by *Echinochloa colonum* (23.11%), *Leerisia hexandra* (17.78%) and *Enhydra fluctuans* (12.44%). Hassan et al. (2010) reported that *Fumaria indica* L. and *Carthamus oxycantha* had very high frequency (90% and 80%) and Hakim et al. (2011) reported that the most common and frequent grass weed species was *Echinochloa crusgalli,* covering 85.71% of rice fields.

Density (D)

Cyperus rotundus had the highest density (20.7) followed by *Echinochloa crusgalli*, *Leucas lavendulifolia*, *Cynodon dactylon*, *Ammannia baccifera*, *Desmodium triflorm*, *Mecardonia procumbens*, *Vicia sativa*, *Euphorbia hirta*, *Chenopodium album*, *Oxalis corniculata*, *Alternanthera sessilis*, *Phyllanthus niruri*, *Marsilea quadrifolia*. The lowest density (0.4) was obtained in *Aerva sanguinolenta* (Table 1). Noor et al. (2012) reported that maximum weed density was recorded in weedy check plots.

Abundance (A)

The highest abundance (20.7) was found in *Cyperus rotundus* followed by *Echinochloa crusgalli*, *Leucas lavendulifolia*, *Cynodon dactylon*, *Ammannia baccifera*, *Mecardonia procumbens*, *Desmodium triflorm*, *Vicia*

sativa, *Euphorbia hirta*, *Chenopodium album*, *Oxalis corniculata*, *Alternanthera sessilis*, *Phyllanthus niruri*, *Marsilea quadrifolia*. The lowest abundance (1.33) was found in *Aerva sanguinolenta* (Table 1). Hakim et al. (2012) reported that *Fimbristylis miliacea* was the most abundant weed and *Echinochloa crusgali* was second most abundant weed.

Relative density (RD)

In species *Cyperus rotundus*, the relative density was found highest (21.5%) followed by *Echinochloa crusgalli*, *Leucas lavendulifolia*, *Cynodon dactylon*, *Ammannia baccifera*, *Desmodium trifform*, *Mecardonia procumbens*, *Vicia sativa*, *Euphorbia hirta*, *Chenopodium album*, *Oxalis corniculata*, *Alternanthera sessilis*, *Phyllanthus niruri*, *Marsilea quadrifolia*. It appeared that the lowest RD (0.42%) was obtained in *Aerva sanguinolenta* (Table 1). According to BARI report (2002), the dominant weed species in the tomato Field 1 were *Eleusine indica*, *Echinochloa crusgalli* and *Amaranthus viridis* and *Amaranthus viridis* showed higher relative density (67.42%) value and in the tomato Field 2, the dominant weed species were *Echinochloa crusgalli*, *Cynodon dactylon, Paspalum commersonni and Amaranthus viridis* and *Cynodon dactylon* showed higher relative density (59.83%) value.

Relative frequency (RF)

Relative frequency is a good indicator of species distribution at a given site. The highest (9.17%) relative frequency was obtained in *Cyperus rotundus, Ammannia baccifera, Cynodon dactylon* and *Echinochloa crusgalli.* The RF value of 8.25% was found in *Desmodium trifform*, 7.34% in *Leucas lavendulifolia*, *Vicia sativa* and *Mecardonia procumbens*, 6.42% in *Oxalis corniculata* and *Euphorbia hirta*, 5.50% in *Chenopodium album*, 4.58% in *Phyllanthus niruri*, 3.67% *Alternanthera sessilis* and *Marsilea quadrifolia*. The lowest RF (2.75%) was found in *Aerva sanguinolenta* (Table 1).

Relative abundance (RA)

In *Cyperus rotundus*, the relative abundance was found highest (18.36%) followed by *Echinochloa crusgalli*, *Leucas lavendulifolia*, *Cynodon dactylon*, *Ammannia baccifera*, *Mecardonia procumbens*, *Desmodium trifform*, *Vicia sativa*, *Euphorbia hirta*, *Chenopodium album*, *Oxalis corniculata*, *Alternanthera sessilis*, *Phyllanthus niruri* and *Marsilea quadrifolia*. The lowest RA (1.18%) was found in *Aerva sanguinolenta* (Table 1). Hakim et al. (2011) reported that most of the abundant weed species were annual in nature. Thomas (1985) observed from weed survey that the relative abundance value clearly indicated a very few dominant weed species.

Importance value index (IVI %)

Important value is a most comprehensive indicator of a phytosociology of a habitat. Among the 15 weed species, maximum IVI was observed in *Cyperus rotundus* (16.35%) followed *Echinochloa crusgalli*, *Leucas lavendulifolia*, *Cynodon dactylon*, *Ammannia baccifera*, *Desmodium trifform*, *Mecardonia procumbens*, *Vicia sativa*, *Euphorbia hirta*, *Chenopodium album*, *Oxalis corniculata*, *Alternanthera sessilis*, *Phyllanthus niruri* and *Marsilea quadrifolia*. The lowest IVI (1.45%) was found in *Aerva sanguinolenta* (Table 1).

Table 1. Weed species and their quantitative characters in three rapeseed varieties

Name of species	Name of family (Cronquist 1981)	Total No. of quadrats in which the species occurred	Total No. of species in all the quadrats	Frequency (%)	Density	Abundance	Relative density (%)	Relative frequency (%)	Relative abundance (%)	Importance value index (%)
1. Cyperus rotundus	Cyperaceae	30	621	100	20.7	20.7	21.5	9.17	18.36	16.35
2. Desmodium triflorm	Fabaceae	27	213	90	7.1	7.8	7.38	8.25	6.93	7.52
3. Leucas lavendulifolia	Laminaceae	24	315	80	10.5	13.13	10.90	7.34	11.65	9.96
4. Ammannia baccifera	Lythraceae	30	264	100	8.8	8.80	9.14	9.17	7.81	8.71
5. Alternanthera sessilis	Amaranthaceae	12	36	40	1.2	3.00	1.24	3.67	2.66	2.52
6. Cynodon dactylon	Poaceae	30	291	100	9.7	9.70	10.08	9.17	8.61	9.28
7. Oxalis corniculata	Oxalidaceae	21	81	70	2.7	3.85	2.81	6.42	3.42	4.22
8. Vicia sativa	Fabaceae	24	168	80	5.6	7.00	5.82	7.34	6.21	6.46
9. Chenopodium album	Chenopodiaceae	18	105	60	3.5	5.83	3.64	5.50	5.17	4.77
10. Mecardonia procumbens	Scrophulariaceae	24	201	80	6.7	8.37	6.97	7.34	7.43	7.24
11. Echinochloa crusgalli	Poaceae	30	396	100	13.2	13.20	13.72	9.17	11.71	11.53
12. Euphorbia hirta	Euphorbiaceae	21	135	70	4.5	6.43	4.67	6.42	5.71	5.59
13. Phyllanthus niruri	Euphorbiaceae	15	27	50	0.9	1.80	0.935	4.58	1.59	2.37
14. Marsilea quadrifolia	Marsileaceae	12	21	40	0.7	1.75	0.73	3.67	1.55	1.98
15. Aerva sanguinolenta	Amaranthaceae	9	12	30	0.4	1.33	0.42	2.75	1.18	1.45

Conclusion

The highest frequency, density, abundance and importance value index in all the three treatments were exhibited by *Cyperus rotundus*. The lowest of the above characters were exhibited by *Aerva sanguinolenta*, *Marsilea quadrifolia* and *Amaranthus spinosus* in no weeding, one weeding and two weedings, respectively. So, *Cyperus rotundus* may be called the most frequent and troublesome weed in the rapeseed field.

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