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Present status of weed flora in soybean crop in Jabalpur district of Kymore plateau & Satpura Hills Zone of Madhya Pradesh

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Abstract
A field experiment was conducted during *Kharif* 2017-2018 at the Research Farm, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). The investigation was aimed to study the present status of different weed flora found in soybean at Jabalpur district of Kymore Plateau & Satpura Hills Zone of Madhya Pradesh. Different weed flora observed in experimental field were classified as monocots like *Echinochloa colona, Cyperus iria* and dicots like *Mollugo pentaphylla, Cichorium intybus, Phyllanthus urinaria, Eclipta alba.* The study also indicated the infestation was maximum by monocots weeds in soybean as compared to dicots. *Echinochloa colona* was found as dominant and frequent weed in soybean. The higher relative density (37.47 and 50.27%) and frequency (20.34 and 21.43%) were reported in case of *Echinochloa colona,* Which had highest important value index (57.81 and 71.70 out of 200) during both *Kharif* seasons 2017 and 2018 and followed by *Mollugo pentaphylla.* The highest important value index of *Echinochloa colona* also indicates the predominance of weed in soybean at present in Jabalpur district of Kymore Plateau & Satpura Hills Zone of Madhya Pradesh.

Keywords: Present status, weed flora, soybean, frequency, important value index

Introduction
Soybean is an important oilseed crop and plays a vital role in sustaining the oilseed production in India. Madhya Pradesh is known as soybean bowl of India, contributing about 65-70 % of total soybean production in India. In the cultivation of crop, losses due to weeds are one of the major limiting factors. Weeds compete with crop for light, moisture and nutrients during critical period of crop weed competition. First 30 days after sowing of soybean is critical with their respect to weed-crop competition. Soybean is found very sensitive to early weed competition. Soybean being a rainy season crop is heavily infested with many grasses and broad leaf weeds. Soybean suffers a lot from a number of weeds such as *Trianthema portulacastrum,* Digera arvensis, *Digiteria sanguinalis, Echinochloa colona, Dactyloctenium aegyptium* (Kewat, 1998) [3]. A similar study was conducted by Panda *et al.* (2015) [9] at Jabalpur, also clarified that Grassy weeds were predominant (76.25%) in the experimental field as compared with broadleaved weeds (23.75%). However, *Echinochloa colona* (33.90%) and *Dinebra retroflexa* (23.90%) were predominant in soybean. But other weeds (*Cyperus rotundus, Cynodon dactylon, Alternanthera philoxeroides, Eclipta alba* and *Mollugo pentaphylla*) were also present. Sandil *et al.* (2015) [10]. at Jabalpur reported that weed species identified in the experimental field was comprises of monocot weeds *Cyperus rotundus* (25.8 and 23.6%) followed by *Echinochloa colona* (23.1 and 23.3%) and *Commelina benghalensis* (15.6 and 17.8%). Beside these dicot weeds, *Eclipta alba* (19.1 and 20.3%) and *Alternanthera philoxeroides* (16.4 and 14.9%) were also found in soybean ecosystem at 45 DAS and harvest stage, respectively. Lal *et al.* (2017) [7] observed that experimental field of soybean was infested with monocot weeds like *Echinochloa colona* (29.28%), *Dinebra retroflexa* (35.85%), *Cyperus iria* (1.65%) and dicot weeds like *Euphorbia geniculata* (24.67%), *Phyllanthus niruri* (8.53%) and *Commelina benghalensis* (2.63%). If weed are not control in time, they caused yield reduction in the ranged of 58 to 85 per cent, depending upon the types and intensity of weeds (Kewat *et al.,* 2000) [3]. Whereas, Gidesa and Kebede (2018) [4] recorded maximum seed yield reduction (78.50%) in soybean. Due to change in climate and shift in agricultural practices, new species of weeds are also emerging as a threat for cultivation of soybean. Therefore, the present experiment was conducted to know the present status of weed flora in

soybean crop in Jabalpur district of Kymore Plateau & Satpura Hills Zone of Madhya Pradesh.

Materials and Methods

A field experiment was conducted during *Kharif* season of 2017 and 2018 at the Research Farm, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). Sowing of soybean variety JS 20-69 was done manually at the rate of 80 kg/ha using normal package of practices for soybean. Weeds were allowed to grow with soybean. The observations on weeds were recorded species wise at 30 DAS which is the most critical period for crop weed competition. The observations on weeds were taken manually by using quadrat of 0.25 square meter (0.5 m x 0.5 m). Quadrat was randomly placed at 12 places in weed infested plots to calculate the weed indices. The different weed indices were worked out as per the formulas suggested by Walia (2009) [14].

$$\text{Density/m}^2 = \frac{\text{Total number of individuals of species A in all the quadrates}}{\text{Total number of quadrats plotted}}$$

If quadrat size 0.5 × 0.5 m^2 is used, then value is multiply by 4 to get density/m^2

$$\text{Frequency (\%)} = \frac{\text{Number of quadrats where the species A occurred}}{\text{Total number of quadrats plotted}} \times 100$$

$$\text{Relative density (RD) (\%)} = \frac{\text{Density of species A}}{\text{Sum of density of all species}} \times 100$$

$$\text{Relative Frequency (RF) (\%)} = \frac{\text{Frequency of species A}}{\text{Sum of frequency of all species}} \times 100$$

Hence, the following weeds were taken during the studies which provides a firm base for the current investigations

Table 1: Status of weed flora associated with soybean at different years

Weed flora	Bhan and Kewat (2003) [1]	Singh and Rajkumar (2008) [12]	Upadhyay *et al.* (2012) [13]	Dubey (2013) [13]	Panda *et al.* (2015) [9]	Patel *et al.* (2019) [10]
Echinochloa colona	-	+	+	+	+	+
Echinochloa crusgalli	+	-	-	-	-	-
Cynodone dactylon	+	-	-	-	+	-
Dinebra retroflexa	-	+	+	+	+	+
Cyperus royundus	+	+	-	-	+	+
Cyperus iria	-	-	+	+	-	-
Eclipta alba	+	-	+	-	+	-
Commelina benghalensis	-	-	-	+	-	-
Commelina communis	+	-	-	-	-	-
Cyanotis auxiliaries	+	-	-	-	-	-
Ageratum conyzoides	+	-	-	-	-	-
Alternanthera philoxeroides	-	-	+	+	+	-
Mollugo pentaphylla	-	+	-	-	+	+
Cichorium intybus	+	-	-	-	-	-
Lindernia ciliate	-	+	-	-	-	+
Parthenium hysterophorus	+	-	-	-	-	-
Phyllanthus niruri	+	-	-	-	-	-
Phyllanthus urinaria	-	-	-	-	-	-

* + sign denotes weed present and - sign denotes weed absent

Results and discussion

Weed flora like monocots *Echinochloa colona, Cyperus iria* and dicots like *Mollugo pentaphylla, Cichorium intybus, Phyllanthus urinaria, Eclipta alba* observed in experimental field at Jabalpur district of Kymore Plateau & Satpura Hills Zone of Madhya Pradesh as that of Bhan and Kewat (2003) [1]. Species wise data on weed density, frequency, relative density, relative frequency and Important Value Index (IVI) were also computed from weed infested plots at critical period of crop-weed competition (30 DAS) during *Kharif* 2017-2018 and are same presented in Table 2 and 3.

It is evident from the data that the density of monocot weeds was higher (50.25 and 60.65%) as compared to the dicot weeds (49.75 and 39.35%) in soybean at Jabalpur district during both season 2017 and 2018, respectively. Among the monocot weeds, *Echinochloa colona* was more rampant constituting 37.47 and 50.27% relative density, whereas, *Mollugo pentaphylla* was dominant among the dicots (22.60 and 22.49%) during both season, respectively. However, other monocot weeds like *Cyperus iria* (12.78 and 10.38%) as well as dicot weeds *Cichorium intybus* (9.34 and 6.05%), *Phyllanthus urinaria* (12.16 and 7.24%) and *Eclipta alba (5.65 and 3.57%)* also marked their presence in lesser numbers in soybean during both season. The similar result was reported by Lodha, (2018) [8] and Bhimwal *et al.* (2018) [2].

Table 2: Density and frequency of weeds in soybean during both *Kharif* season 2017 and 2018.

Weed flora	Density of weeds (no./m^2)		Frequency (%)	
	2017	2018	2017	2018
Monocot weeds				
Echinochloa colona	101.67	155.00	100.00	100.00
Cyperus iria	34.67	32.00	75.00	66.67
Total monocots	136.33	187.00	87.50	83.33
Dicot weeds				
Mollugo pentaphylla	61.33	69.33	100.00	100.00

Cichorium intybus	25.33	18.67	91.67	75.00
Phyllanthus urinaria	33.00	22.33	75.00	83.33
Eclipta alba	15.33	11.00	50.00	41.67
Total dicots	135.00	121.33	79.17	75.00

Echinochloa colona and *Mollugo pentaphylla* are most frequent weeds in soybean crop with higher relative frequency (20.34 and 21.43%) as compared to other weeds and because of this both weeds appeared during both the seasons. However, the other weeds like *Cyperus iria*, *Cichorium intybus*, *Phyllanthus urinaria* and *Eclipta alba* (lowest relative frequency 10.17 and 8.93% in both the seasons) also present in soybean field but were less frequent.

The highest IVI was recorded in case of *Echinochloa colona* (57.81 and 71.70 out of 200) and followed by *Mollugo pentaphylla* (42.94 and 43.92) during both seasons, respectively. Whereas, *Eclipta alba* was having the lowest IVI (15.82 and 12.50 out of 200) during both seasons. The highest IVI of *Echinochloa colona* indicated that *Echinochloa colona* is the most rampant weed in soybean as compared to other weeds.

Table 3: Relative density, relative frequency and important value index of weeds in soybean during both *kharif* season 2017 and 2018.

Weed flora	Relative Density (%)		Relative Frequency (%)		Important Value Index (IVI)	
	2017	2018	2017	2018	2017	2018
Monocot weeds						
Echinochloa colona	37.47	50.27	20.34	21.43	57.81	71.70
Cyperus iria	12.78	10.38	15.25	14.29	28.03	24.66
Total monocots	50.25	60.65	52.50	52.63	102.75	113.28
Dicot weeds						
Mollugo pentaphylla	22.60	22.49	20.34	21.43	42.94	43.92
Cichorium intybus	9.34	6.05	18.64	16.07	27.98	22.13
Phyllanthus urinaria	12.16	7.24	15.25	17.86	27.42	25.10
Eclipta alba	5.65	3.57	10.17	8.93	15.82	12.50
Total dicots	49.75	39.35	47.50	47.37	97.25	86.72

Hence, the weed flora differed from the previously reported species as mentioned above. And during the studies, it was also noticed that due to changing climatic conditions and alteration of agricultural practices, the weed flora once considered as minor are becoming major threat in the profitable cultivation of soybean. The dominance of weed flora over a crop after a certain period of time may adversely affect the crop as well as the environment. Therefore, the study of nature and habitat of weeds is now becoming very important for sustainable crop production and to create proper control measures against the weeds at critical crop growth stages.

Conclusion

It was concluded that *Echinochloa colona* was found as the most dominating weed in soybean followed by *Mollugo pentaphylla* in Jabalpur district of Kymore Plateau & Satpura Hills region of Madhya Pradesh.

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