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Identification of Problematic Weeds in Chickpea Crop in Jabalpur District of Madhya Pradesh, India

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A B S T R A C T

A field experiment was conducted during *rabi season* 2018-2019 and 2019-20 at the Research Farm, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). The investigation was aimed to study the problematic weeds in chickpea at Jabalpur district of Kymore Plateau and Satpura Hills Zone of Madhya Pradesh. Different weed species which infested the chickpea crop were comprised of broad leaved weeds namely *Cichorium intybus*, *Medicago truncatula, Melilotus indica*, *Anagallis arvensis* and *Chenopodium album*. Among the associated broad leaved weeds, *Cichorium intybus* was most important problematic weed in chickpea having the highest relative density (30.36 and 33.80%), frequency (27.27 and 27.27 %), relative dominance (23.41 and 24.90%) and important value index (57.63 and 61.08 out of 200) during *rabi* season 2018-19 and 2019-20 followed by *Medicago truncatula* and *Melilotus indica*. The other weeds *viz.*, *Anagalis arvensis* and *Chenopodium album* were of less importance as both weeds attained low value of relative density, relative frequency, relative dominance and important value index.

Introduction

Chickpea (*Cicer arietinum L.*) ranks third among pulse legumes in the world (Rawal and Navarro, 2019). It contains 18.24% protein which is three times more than the cereals and considered as an economical source of quality protein for human diet. Madhya Pradesh rank first in chickpea acreage and production, contributing nearly 33.99 and 40.92% respectively to the total area and production of chickpea in the country, respectively (Annonymous, 2018). In the cultivation of chickpea crop, weeds are one of the major limiting factors. Chickpea crop is mainly infested with broad leaf weeds rather than grassy weeds. In chickpea a number of broad leaved weeds invade the crop namely *Chenopodium album, Melilotus alba, Melilotus indica, Vicia sativa, Lathyrus aphaca*, and *Anagallis arvensis* (Upadhyaya and Bhalla, 2002). However, due to climate change and shift in agricultural practices and cropping system, new weed species are also

emerging as a threat for chickpea cultivation as against the *Chenopodium album* and *Anagalis arvensis* (Sharma *et al.*, 1995). In Jabalpur weed flora in the chickpea was comprised of dicot weeds compared to monocot and there was predominance of *Anagallis arvensis* (73.37 and 83.70%) in chickpea as it had higher density and relative density but *Chenopodium album* was present in lesser number (Chaurasia, 2018).

The dominance of weed flora after a certain period of time may adversely affect the crop as well as the environment, the study of nature and habitat of weeds is now very important for sustainable crop production of chickpea and to create proper control measures against the different weed flora during critical crop growth stages. Keeping above facts in view the present experiment was conducted to identify the problematic weeds in chickpea crop in the present time at Jabalpur district of Madhya Pradesh.

Materials and Methods

A two year field experiment was conducted during *rabi* season 2018-19 and 2019-20 at Live Stock Farm, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). Sowing of chickpea variety 'JG 14' was done manually at the rate of 80 kg/ha using normal package of practices for chickpea. Weeds were allowed to grow with chickpea. The observations on weed density were recorded species wise at 60 DAS. The density of weeds was taken manually by using quadrat of 0.25 m^2 (0.5 X 0.5 m^2) by placing them randomly at 6 places in weed infested plots to calculate different weed indices. The weed indices were workout as per the formulas suggested by Walia (2009).

$$\text{Absolute density} = \frac{\text{Total number of individual of a species}}{\text{Total number of quadrats studied}}$$

$$\text{Relative density (R.Dn.) (\%)} \quad \frac{\text{Total number of individual of a species in all quadrats}}{\text{Total number of individual of all the species in all quadrats}} X100$$

$$\text{Absolute frequency (\%)} = \frac{\text{Number of quadrats in which a species occured}}{\text{Total number of quadrats studied}} X100$$

$$\text{Relative frequency (RF) (\%)} = \frac{\text{Absolute frequency of a species}}{\text{Sum of absolute frequency values of all species}} X100$$

$$\text{Weed abundance} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats in which the species occured}}$$

$$\text{Relative dominance (R.Do.)} = \frac{\text{Abundance of a species}}{\text{Sum-total of abundance of all species}} X100$$

Important value index (IVI) = Relative density + Relative frequency.+ Relative dominance.

The following study was taken into consideration which provides a firm base for the current investigation (Table 1).

Results and Discussion

Associated weed flora

Weed flora namely *Cichorium intybus*, *Medicago truncatula*, *Melilotus indica*, *Anagallis arvensis* and *Chenopodium album* was observed in chickpea field to that of Sneha (2019) at Jabalpur District of Madhya Pradesh. Species wise data on weed density, frequency, abundance, relative density, relative frequency, relative abundance and Important Value Index (IVI) were also computed from weed infested plots at 60 DAS during *rabi* 2018-19 and 2019-20 and data are presented in Table 2 and 3. It is evident from the data only dicot weeds were present in chickpea during both the season. Among the dicot weeds, *Cichorium intybus* (30.36 and 33.80%), *Medicago truncatula* (20.70 and 23.70%) and *Melilotus indica* (19.52 and 21.69%) were more predominant. However,

other dicot weeds like *Anagallis arvensis* (19.50 and 10.70%) and *Chenopodium anbum* (9.88 and 10.70%) also marked their presence in less numbers. The similar weed flora was also reported by Baghel (2018) at the same place.

Table.1 Status of weed flora in chickpea at different years

Weed flora	Sharma *et al.*, (1995)	Sahu *et al.*, (2020)
Asphodelus tenuifolius	+	-
Anagalis arvensis	-	+
Avena fatua	+	-
Brassica kabar	+	-
Lathyrus aphaca	+	-
Medicago denticulata	+	-
Melilotus indica	+	+
Melilotus alba	+	-
Phalaris minor	+	-
Trigonella polycerata	+	-
Argemone mexicana	+	-
Chenopodium album	+	+
Medicago truncatula	-	+
Cichorium intybus	+	+
Rumex dentatus	+	-
Sphaeranthus indicus	+	-
Vicia hirsuta	+	-
Vicia sativa	+	-
Convolvulus arvensis	+	-
Cynodon dactylon	+	-
Cyperus rotundus	+	-

*+ Sign denoted weed present and – sign denotes weed absent

Table.2 Density and frequency of chickpea during both years (2018-19 and 2019-20)

weed flora	Density of weeds (No./m^2)		Absolute frequency (%)		Weed abundance	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
Cichorium intybus	84.00	80.00	100.00	100.00	14.00	13.33
Medicago truncatula	57.33	54.67	83.33	83.33	10.93	10.93
Melilotus indica	54.00	51.33	66.67	66.67	13.50	12.83
Anagalis arvensis	49.00	30.33	66.67	50.00	12.25	10.11
Chenopodium album	27.33	25.33	50.00	66.67	9.11	6.33
Total	271.67	241.66	366.67	366.67	59.79	53.54

Table.3 Relative density, relative frequency and important value index of weeds in chickpea during both years (2018-19 and 2019-20)

weed flora	Relative density (%)		Relative frequency (%)		Relative dominance (%)		Important Value index (IVI)	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
Cichorium intybus	30.92	33.10	27.27	27.27	23.41	24.90	81.61	85.28
Medicago truncatula	21.10	22.62	22.73	22.73	18.28	20.42	62.12	65.77
Melilotus indica	19.88	21.24	18.18	18.18	22.58	23.97	60.64	63.39
Anagalis arvensis	18.04	12.55	18.18	13.64	20.49	18.88	56.71	45.07
Chenopodium album	10.06	10.48	13.64	18.18	15.24	11.83	38.94	40.49
total	100.00	100.00	100.00	100.00	100.00	100.00	300.00	300.00

Cichorium intybus and *Medicago truncatula* were most frequently occurred in chickpea as both were having higher relative frequency (27.27 and 27.27%; 22.73 and 22.73% respectively) as compared to other weeds because of prolific seed production and enrichment of weed seed bank in soil every year by both the weeds. However, the other weeds like *Melilotus indica* (18.18 and 18.18%), *Anagallis arvensis* (18.18 and 13.64%) and *Chenopodium album* (13.64 and 18.18%) were occurred in chickpea in comparatively lesser frequency on account of wider periodic of germination from soil and their effective control with the adoption of weed control measures particularly broad spectrum herbicides could be assigned the reason for lesser density of these weeds at this point of time. In case of relative dominance, maximum maximum value was recorded in case of *Cichorium intybus* (23.41 and 24.90%) followed by *Melilotus indica* (22.58 and 23.97%) and *Medicago truncatula* (18.28 and 20.42%) during both years. The highest IVI was recorded in case of *Cichorium intybus* (81.60 and 85.28 out of 300) followed by *Medicago truncatula* (62.12 and 65.77) during *rabi* 2018-19 and 2019-20, respectively. Whereas, *Melilotus indica*, *Anagallis arvensis* and *Chenopodium album* recorded lower values of IVI as compared to *Cichorium intybus* during both years. The highest IVI of *Cichorium intybus* indicated that it was most problematic weed in chickpea followed by *Medicago truncatula* and *Melilotus indica* compared to other weeds. Patidar *et al.*, (2019) also observed similar IVI in case of wheat at Jabalpur.

It was concluded that *Cichorium intybus*, *Medicago truncatula* and *Melilotus indica* were problematic weeds in chickpea in Jabalpur district of Madhya Pradesh.

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