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WEED FLORA OF *Curcuma longa* FIELDS OF DISTRICT KASUR, PAKISTAN

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ABSTRACT

District Kasur, Punjab, Pakistan shares more than 80% of turmeric production. Survey of fields from twenty six localities of the district were undertaken during two successive years to study the distribution of weed species in turmeric (Curcuma longa L.) fields. A total of fourteen weed species belonging to 8 angiosperm families, were recorded in the fields of turmeric. Sonchus aspera L., Chenopodium album L., Rumex dentatus L., Ageratum conyzoides L. Convolvulus arvensis L., Cynodon dactylon (L.) Pers., Oxalis corniculata L., Malva parviflora L., Malvastrum coromandelianum L., Trifolium resupinatum L., Euphorbia prostarta L. and Phalaris minor Retz., were found to be the most prevalent weed species occurring in 90% or more studied areas during one or the other growing season. The frequently occurring weeds with absolute frequency of above 80% were C. album L., M. cromandlianum L. and C. dactylon. Other densely populated weed species with higher absolute density were A. conyzoides, C. arvensis, E. prostrata and C. dactylon. The study highlighted the need to manage weed in order to realize higher turmeric yields.

Key words: Turmeric (*Curcuma longa*), weeds, Kasur, Pakistan, survey.

INTRODUCTION

Turmeric is a root crop of Zingiberaceae propagated by rhizomes. It is one of the most important medicinal plants due to its antioxidant properties and protective powers for our health (Majeed *et al.,* 1995). Curcumin and volatile oils in the rhizome of turmeric are known to prevent cancer diseases, tumors and the production of free radicals, and to improve liver and kidney functions (Hermann and Martin, 1991) found antibacterial activities of essential oils in *Curcuma longa* L. It has been used for a long time in Bangladesh, India, Myanmar, Pakistan, Sri Lanka and Thailand as a spice, cosmetic and medicine. Recently, it is used worldwide as a spice and natural medicine (Hermann and Martin, 1991).

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Studies on emergence pattern, growth and development of a plant species as influenced by edaphic factors are important for better production (Hossain, 1999; Ghorbani *et al*., 1999). It is essential to plant a root crop at the proper planting depth to obtain a higher yield, because soil type, bulk density and soil ecological factors affect the growth and development of rhizomes and tubers (Aoi*,* 1988; Hossain, 1999; Peng, 1984)

Agriculture plays an important role in the economy of Pakistan. It contributes up to 25% in the national GDP (Anonymous, 2007.). Agriculture sector is mainly confined to the cultivation of major crops as wheat, rice, cotton and sugar cane. The presence of weeds in the fields and their impact on the crop production and environment has been well documented (Morse *et al.,* 1995; Randall, 1996; Fröhlich *et al.,* 2000; Hassan and Marwat, 2001)

Weeds are the main problem with turmeric (*Curcuma longa* L.) cultivation where herbicides are not used. This is because herbicides cause water contamination, air pollution, soil microorganism hazards, health hazards, and food risks. Considering turmeric's medicinal value and the environmental problems caused by herbicides, various agronomic practices have been evaluated for non-chemical weed control in turmeric (Hossain, 2005).

Weed surveys are useful for determining the occurrence and importance of weed species in crop production systems (Frick and Thomas, 1992). Documenting the kinds of weed species and its relative distribution facilitates the establishment of priorities for research and extension services (McClosky *et al.,* 1998). A survey was conducted in Lahore district to highlight the distribution of different weed species in Gladiolus fields (Riaz *et al.,* 2007).

MATERIALS AND METHODS

Field Surveys

Field surveys of different turmeric growing areas in district Kasur Pakistan were conducted during the growing season of December 2009-January 2010. Twenty six localities in district Kasur were selected i.e. Atari Karm Singh, BakerKe, Usmanwala, Jajjar, Akkike, Kanganpur, Lande, Saresar, MoujeKe, Bahigiwal, Dhatte, Muqam village, Macchina, Mustuwal, Arzani Pur, Atri Wirk, Khuddian Khas, Muhammadi Pur, Laddi, Wiram, Wan Khara, Sham Kot Nuth, Wirk Nau, Burj Ran Singh, Singh Wala and Biya for study of weed distribution. Sampling was done randomly using 1×1 m^2 quadrat. Data regarding prevalence, absolute and relative frequency, and absolute and relative density of weeds were recorded by applying the following formulae (Riaz *et al.,* 2007).

$$\text{Absolute frequency (AF) (\%)} = \frac{\text{Number of quadrates in which species occurs}}{\text{Total number of quadrates}} \times 100$$

$$\text{Relative frequency (RF) (\%)} = \frac{\text{Absolute frequency value for a species}}{\text{Total absolute frequency values for all species}} \times 100$$

$$\text{Absolute density (AD)} = \frac{\text{Total number of individuals of all species in all quadrates}}{\text{Total number of quadrates}}$$

$$\text{Relative density (RD) (\%)} = \frac{\text{Absolute density for a species}}{\text{Total absolute density for all species}} \times 100$$

RESULTS AND DISCUSSION

In the present study fourteen weed species belonging to eight angiosperm families were found growing in turmeric fields of District Kasur, belonging to family Asteraceae, Poaceae Chenopodiaceae, Euphorbiaceae, Ranunculaceae. Brassicaceae, Malvaceae and Solanaceae contained one species each.

Only one species (*Chenopodium album*) found in all the twenty six fields showing 100% prevalence, *Rumex dentatus* and *Sonchus aspera* species were found in 90% prevalence. Three species namely *Euphorbia prostrata, Phalaris minor, Ageratum conyzoides* and *Malvastrum coromandelianum* exhibited 80% prevalence each (Table-1).

Rumex dentatus with 60% absolute frequency (AF) and 7.5% relative frequency (RF) was found to be the most frequently occurring weed followed by *Anagallis arvensis* and *Trifolium resupinatum* with 50 % AF and 6.25 % RF each. Other frequently occurring species were *Convolvulus arvensis, Malva parviflora, Cirsium arvense, Oxalis corniculata* were also found. The least frequently occurring species with AF of 20% was *Parthenium hysterophorus* (Table-1).

Weed emergence and interference are not affected by planting depth, seed size, planting pattern, planting space, ridge spacing, and the row number of turmeric until 60 days after planting. This is because turmeric cannot develop a canopy structure until then. Thereafter, weed infestation reduces similarly and significantly when turmeric is planted at depths of 8, 12, and 16cm, compared to shallower depths. The yield of turmeric at these depths is statistically the same, but the yield for the 16cm depth is difficult to harvest and it tends to decrease. Turmeric grown from seed rhizomes (daughter rhizomes) weighing 30-40g reduces weed infestation significantly (Hossain, 2005). Since this is the first report of weed distribution in turmeric fields in Pakistan so the quality and yield losses in turmeric due to infestation of these weeds are not known. However, the frequently occurring species viz. *R. dentatus*, *A. arvensis, M.*

coromandelianum, *C. arvensis* and *M. parviflora* are also found in other crops especially in wheat where they are known to cause heavy yield losses due to competition for nutrients, water, and space and sometimes through the release of allelochemicals (Rabbani and Bajwa, 2001). In the present study *P. hysterophorus* was found only with 20% AF and 2.5 % RF (Table-1). However being an invasive weed, it is most likely that in future this aggressive alien weed may become one of the problematic weed due to its high reproductive potential, fast growth rate and allelopathic nature (Dagar *et al.,* 1976; Navie *et al.,* 1996; Singh *et al*., 2005) and suitable field conditions as turmeric is cultivated on ridges with sufficient plant to plant distance.

A. conyzodies and M. coromandelianum were found to be the most densely populated weed with 1.33 plants m^{-2} and a relative density (RD) of 10 (Table-1). These are also of major concern in various crops of economic importance including wheat in India and Pakistan (Chhokar *et al.,* 2007; Anjum and Bajwa, 2007; Mehmood *et al.,* 2007).

The present study reveals that turmeric fields are infested with many well known problematic weed species especially *C. album, C. arvensis, P. hysterophorus, C. arvensis, M. coromandelianum and R. dentatus* which are well known for their adverse impacts on crop growth and productivity as well as quality of the produce. There is an urgent need to take necessary intervention to create awareness among the farmers for adopting integrated weed management strategies to improve and maintain the quality and yield of turmeric.

Table-1. Absolute frequency (AF), Relative frequency (RF), Absolute density (AD) and Relative density (RD) of weeds in turmeric fields in District Lahore, Pakistan.

Weeds	A.F %	R.F %	A.D	R.D%
Sonchus aspera	70	8.75	0.7	7.95
Chenopodium album	80	10	0.7	7.95
Rumex dentatus	60	7.5	0.6	6.8
Ageratum conyzoides	80	10	0.8	9.09
Convolvulus arvensis	70	8.75	0.7	7.95
Cynodon dactylon	80	10	---	---
Oxalis corniculata	60	7.5	0.6	6.8
Malva parviflora	70	7.5	0.7	7.95
Malvestrum cromandlianum	80	10	0.8	9.09
Euphorbia prostarta	80	10	0.8	9.09
Anagallis arvensis	50	6.25	0.5	5.68
Trifolium resupinatum	50	6.25	0.5	5.68
Phalaris minor	70	8.75	0.7	7.95
Cirsium arvense	60	7.5	0.8	9.09
Parthenium hysterophorous	20	2.5	0.2	2.8

A.F % = Absolute Frequency %, R.F % = Relative Frequency %
A.D. = Absolute Density, R.D. % = Relative Density %

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