Ilkogretim Online - Elementary Education Online, 2021; Vol 20 (Issue 5): pp. 6863-6869
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2021.05.774

Floristic Composition and Phytosociological Studies of Weeds of Garlic (Allium sativum) Crop of District Bannu, Khyber Pakhtunkhwa, Pakistan.

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ABSTRACT- Garlic (*Allium sativum*) is the most imperative crop supporting the economy of district Bannu, Pakistan. Weeds grounds massive fatalities to the quantity as well as quality of the crop. A survey was launched during November 2030, to record the phytosociological status of garlic farms. An over-all of 21 garlic growers from seven villages in district Bannu, Pakistan, were arbitrarily nominated. At each farm, the density of weeds was determined using standard quadrate method. The density data were subjected to analysis to compute Relative density (%), Frequency (%), Relative frequency (%) and Importance value. *Alopecurus mysorroides* emerged as the predominant species in the district. The highest importance value of *Alopecurus mysorroides* weed was recorded (88.5) in Surrani followed by Mandan (65.1) and Nurar (64.7). Whereas, the highest (38.5) importance value of *Polypogon monspeliensis* was observed in Khujari and Kakki (32.7). *P. monspeliensis – C. dactylon – A. mysorroides* community was recognized at Kakki, *P. monspeliensis – P. aviculare – A. mysorroides* was prevalent in Barat, and *P. monspeliensis – A. mysorroides – C. dactylon* existed at Khujari and *A. mysorroides – C. dactylon – E. heliscopia* commenced at Mandan. At Nurar, Surrani and Mamashkhel the communities predominant were *A. mysorroides – C. dactylon – E. heliscopia*, *A. mysorroides – C. dactylon* and *A. mysorroides – P. monspeliensis – C. dactylon*. *A. mysorroides*, *P. monspeliensis*, and *C. dactylon* in the decreasing order were the major weeds in garlic farms of Bannu. Further studies are suggested to confirm the findings and launch an effective management program.

Key words: Floristic composition, phytosociology, Weeds, Bannu, Pakistan

I. INTRODUCTION

Weeds are the nasty plants that grow in the fields of crops that affect them by competing for light and space [1, 2]. They grow in domesticated crops and interfere with the healthy and normal growth of crops. Sometimes due to weeds infestation, complete crop failure occurs [3-5]. [6] Generally defines a weed as a plant but if its population grows in a specified region or mostly those regions which are markedly disturbed by man. Weeds are mostly successful in a disturbed environment which is mostly a major cause of their fast growth often but they are not a successful herbaceous [7-9]. The largest families of weeds are Asteraceae, Poaceae, Amaranthaceae, and Fabaceae, these families constitute the major flora of weeds in the whole world [10-12]. When the man started to grow plants for food the weeds are also growing as an unwanted plant. They limit the production of economically benefited crops like grains, seeds, and fruits [13, 14]. They have a rapid rate of seed germination, long-term survival, and short span of the life cycle, tolerant to abiotic and biotic stresses. In crop production weed is a serious problem because they compete with crops for getting nutrients, moisture, light, etc., this competition leads to the quality and quantity loss of that crops [15-17]. But the removal of weeds from crops requires high costs that's why producers lose their part of investment and the country also losses a reduction in agriculture products [18, 19]. In Pakistan, the crop yield is reduced by more than 50% due to unchecked weed growth in crops [20, 21]. About 30,000 species of weeds are present in the world and usually 50 to 200 causing damage to major food crops [22, 23]. [24]estimated that 250 weeds species are very common in agricultural crops all over the world. According to [25] In Pakistan, an economic loss of about Rs. 10 billion has been estimated due to weed species annually. According to [26] in Pakistan, the economic loss caused by weeds species is more than 130 billion annually. [27] reported that about $3.3 billion loss occurs by weeds annually in Australia, and [28] reported

that more than US$ 138 billion loss occurs in the US annually. That's why weed control is vital to enhance yield, crop production, and quality. Weeds are quickly growing in the crops and affect their population. It also depends upon the local climatic conditions. They increase the harvesting costs, stop water channels and also increase fire hazards. Weeds lead to the increase of diseases they provide shelter and also act as a host for the pest. The losses of weeds are greater than the losses caused by insects and plant species. About 50 % loss is estimated for those fields where farmers do not practice weed control. According to[29] weeds protect insect and pest diseases which are harmful to plants alongside stealing essential food elements from crops. Some prickly weeds like silybium and carthamus species make them difficult for farmers to get rid of these and to harvest crops. Some weeds can also be used as fodder for grazing animals and among these most common are cynodon dactylon, Dicanthus annulatum, Imperata cylindrical, and paspalum distichum. Verbena officinalis, solanum nigrum, phyla nodiflora, plantago species, and Datura sramonium are used as medicine and also be used in preparing other medicines. Weeds species are a natural source of herbal medicines about 70% of people depend upon a traditional system of medicines [30]. Weeds constantly compete or engage with garlic for its nutrients etc. and if its production is increased it will constantly reduce the yield, quality, and crop value through harvesting costs the crop value can be degraded. Garlic crop is usually planted very close to a small canopy. The leaf size of garlic is usually small just because of this it cannot compete well with weeds. Weeds can compete well with crop plants at their early stages of growth. Weeds interference is very important but slightly acknowledge restraint causes low yield of wheat in Pakistan [31]. The reduction in wheat due to weed can be 17-50%.with the arrival of short-duration varieties weed invasion will be more severe [32]. Weeds reduce crop yield increases the cost to control insect and plant diseases, give a poor quality product and also provide habitat for harmful insects and organisms [33]. The seeds of weeds remain dormant and viable for 30-40 years and the seed coat is hard which can prevent adverse climate diseases and soil conditions [34]. Plants have been used by man from ancient times and most of them used for fiber and medicines are now considered to be weeds which would still be useful but they are replaced by plants of greater productivity and high flavor.

II. MATERIAL AND METHODOLOGY

District Bannu is consider to be one of the principal Garlic growing district of Pakistan. Wheat and Garlic are consider to be the major crop cultivated in winter while in summer sugarcane and other several crops are bring cultivated. Bannu have a semi-arid climate which favor the cultivation of Garlic crop. In a current study seven random location were selected from the garlic growing area of district Bannu. 7-8 weeks after sowing of garlic, weed density m-2 was taken and from the same data, Relative density (%), Frequency (%), Relative Frequency (%) and Importance value of weed species was computed. At each of the selected sites, three gram fields were selected randomly and were surveyed following the methodology of Thomas (1985), McCully et al. (1991) and Thomas (1991) with slight modifications. Five 1x1m2 quadrates were randomly placed along an inverted horizontal pattern in each field. The distance between each quadrate depended upon the size and shape of the field and any obstructions that may have been present in the fields. The larger was the field, the greater was the distance between quadrates. During the course of studies, the data were recorded on the following parameters as adopted from Hussain (1989) and Hussain et al. (2004):

1. Relative Density (%)

$$Relative\ Density\ (\%) = \frac{Mean\ of\ individual\ species}{Mean\ of\ total\ species} \times 100$$

2. Frequency (%)

$$Frequency\ (F)(\%) = \frac{Number\ of\ quadrates\ in\ which\ species\ occure}{Total\ number\ of\ quadates} \times 100$$

3. Relative Frequency (%)

$$Relative\ Frequency\ (RF)(\%) = \frac{Frequency\ value\ of\ a\ single\ species}{Total\ frequency} \times 100$$

4. Importance Value %

$$Importance\ Value\ (IV)\ \% = Relative\ density\ \% + Relative\ frequency\ \%$$

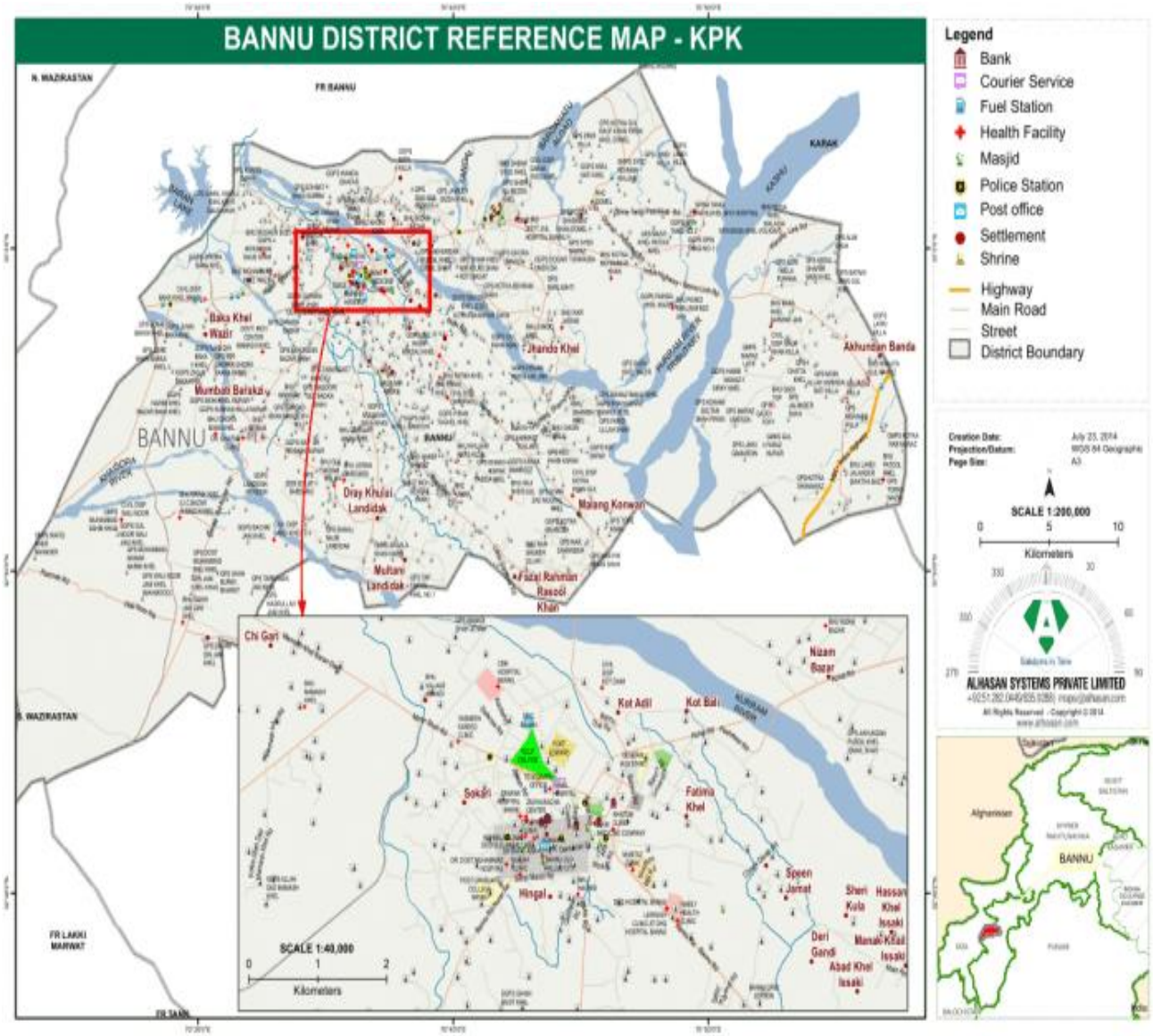

Fig 1. *Map of Study area.*

III. RESULT AND DISCUSSION

In response to changing across the agro ecological regions, planting geometry, sowing/planting periods and planting techniques the weeds populations are constantly being changed and are thought to be dynamic. Agro ecological techniques also determine the weeds population which play a basic role in the production of crop production. So surveys were carried out under the same growing season to understand the dynamics of weed communities**.**

Density m-2

A survey of data in Table 1 display the capricious density of weeds through the diverse positions considered. The over-all density varied between 11.8 in Mamashkhel to 23.9 m-2 at Kakki, Bannu. The variability was also recorded among the relative number of the species recorded in the study area. *Alopecurus mysorroides* was the most abundant weed at 3 out 5 locations. Similarly *Polypogon monspeliensis* was the predominant species at 2 out of 5 sites (Table 1). The mean of the vegetation revealed almost 100% more infestation as compared to the second species in the array (Table 1). Euphorbia helioscopia L. and A. arvensis also had a meager density (Table 1).

Table 1. *Mean density of various garlic weeds species (m^{-2}) across seven location of district Bannu.*

Plants species	Kakki	Barat	Khujari	Mandan	Nurar	Surrani	Mamash khel	Mean
Alopecurus mysorroides	2.5	2.9	2.5	15.8	13.3	16.1	1.4	7.79
Polypogon monspeliensis	11.5	4.1	13.1	0.0	0.2	0.0	2.8	4.53
Cynodon dactylon	3.5	3.6	2.7	2.4	1.4	0.06	1.3	2.14
Polygonum aviculare	3.7	3.3	1.5	0.0	0.05	0.0	4.8	1.91
Rumex dentatus	0.6	1.3	0.0	0.0	0.0	0.0	0.0	0.29
Convolvulus arvensis	0.5	2.3	1.2	0..2	0.9	0.0	1.3	0.91
Euphorbia heliscopia	1.6	3.3	0.0	0.0	0.0	0.0	0.0	0.73
Anagalis arvensis	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.09
Chenopodium album	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.07
Soncus asper	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.04
Total	23.9	20.9	21.2	19.0	16.2	16.2	11.8	

Relative density (%)

The data on relative density of weed species is shown in Table 2. The statistical investigation of the data shown that the highest relative density of 97.2% was recorded in *Alopecurus mysorroides* in Surrani followed by 82.3% relative density of the identical species in Mandan and 81.1%, in Nurar, correspondingly. While the lowermost relative density of *Alopecurus mysorroides* (11.2%) was detected in Kakki. The subsequent predominant weed was *Polypogon monspeliensis* and *Cynodon dactylon* whose relative densities were greater as related to other weeds recorded in the 7 sites (Table 2). *Polygonum aviculare* appeared as the leading species in village Mamashkhel.

Table 2. *Relative density (%) of various garlic weeds species (m^{-2}) across seven location of district Bannu.*

Plants species	Kakki	Barat	Khujari	Mandan	Nurar	Surrani	Mamash khel
Alopecurus mysorroides	11.2	13.8	20.2	82.3	81.1	97.2	20.5
Polypogon monspeliensis	41.5	18.9	52.1	0.0	1.2	0.0	20.9
Cynodon dactylon	14.2	16.1	12.8	13.1	9.3	1.9	10.6
Polygonum aviculare	12.7	15.6	6.8	0.0	0.3	0.0	33.5
Rumex dentatus	3.9	6.3	0.0	0.0	0.0	0.0	0.0
Convolvulus arvensis	2.5	10.9	4.8	3.0	6.5	0.0	12.3
Euphorbia heliscopia	13.3	16.1	0.0	0.0	0.0	0.0	0.0
Anagalis arvensis	0.0	0.0	0.9	0.0	0.0	0.0	0.0
Chenopodium album	0.0	0.0	0.0	0.0	0.0	0.0	1.7
Soncus asper	0.0	0.0	0.4	0.0	0.0	0.0	0.0

FREQUENCY (%)

The perusal of data in (Table 3) demonstrated that most frequent weed species in the study area were *Alopecurus mysorroides* and *Polypogon monspeliensis* (Table 3). The Frequency of *Alopecurus mysorroides* ranged from 59.7% in Mamashkhel to 100% in Mandan, Nurar and Surrani villages revealing that 3 out of 7 sites possessed 100% Frequency for the *Alopecurus mysorroides*. The data further exhibited that 2 out of 7 selected sites had 100% Frequency of *Polypogon monspeliensis* (Table 3). *Cynodon dactylon*, *Polygonum aviculare* and *Convolvulus arvensis* infatuated intermediate frequency. *Anagalis arvensis*, *Chenopodium album* and *Soncus asper* were documented as the minimum frequent species across the selected sites (Table 3).

Table 3. *Frequency (%) of various garlic weeds species (m^{-2}) across seven location of district Bannu.*

Plants species	Kakki	Barat	Khujari	Mandan	Nurar	Surrani	Mamash khel
Alopecurus mysorroides	73.0	79.7	93.1	100.0	100.0	100.0	59.7
Polypogon monspeliensis	100.0	79.8	100.0	0.0	3.1	0.0	26.4

Cynodon dactylon	66.3	66.3	66.3	49.8	59.7	3.1	36.2
Polygonum aviculare	56.4	79.7	53.1	0.0	0.0	0.0	66.4
Rumex dentatus	13.1	29.8	0.0	0.0	0.0	0.0	0.0
Convolvulus arvensis	29.7	59.6	59.6	29.6	39.7	0.0	49.6
Euphorbia heliscopia	73.1	86.3	0.0	0.0	0.0	0.0	0.0
Anagalis arvensis	0.0	0.0	13.0	0.0	0.0	0.0	0.0
Chenopodium album	0.0	0.0	0.0	0.0	0.0	0.0	3.1
Soncus asper	0.0	0.0	13.1	0.0	0.0	0.0	0.0

RELATIVE FREQUENCY (%)

The RF (%) of weeds is a good statistic display the occurrence of weed species in the study area. Amongst totally weed species encountered in the study area, the highest RF of *Alopecurus mysorroides* to the tune of 79.6, 48.0, and 47.6% was recorded in Surrani, Nurar and Mandan, individually (Table 4). A diverse relative frequency of all weeds was documented in Kakki, Barat and Khujari (Table 4). Village appeared as the most specific weed growth area where the garlic crop was completely infected with *Alopecurus mysorroides* and *Cynodon dactylon*. The differential relative frequency across the selected sites warranties variable control measures for the diverse weed species.

Table 4. *Relative Frequency (%) of various garlic weeds species (m^{-2}) across seven location of district Bannu.*

Plants species	Kakki	Barat	Khujari	Mandan	Nurar	Surrani	Mamash khel
Alopecurus mysorroides	17.5	16.3	23.1	47.6	48.0	79.6	43.5
Polypogon monspeliensis	23.7	16.1	24.8	0.0	1.3	0.0	8.4
Cynodon dactylon	15.9	13.5	16.3	23.5	24.7	19.6	10.4
Polygonum aviculare	12.8	16.4	13.1	0.0	1.6	0.0	21.4
Rumex dentatus	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Convolvulus arvensis	8.2	5.7	14.6	0.0	0.0	0.0	0.0
Euphorbia heliscopia	8.1	12.1	0.0	28.4	22.6	0.0	13.5
Anagalis arvensis	17.0	17.9	3.0	0.0	0.0	0.0	0.0
Chenopodium album	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Soncus asper	0.0	0.0	2.9	0.0	0.0	0.0	1.5

IMPORTANCE VALUE OF WEEDS

The Importance Value determination is a good indicator for the flora impeding the crop growth. The highest importance value of *Alopecurus mysorroides* weed was recorded (88.5) in Surrani followed by Mandan (65.1) and Nurar (64.7). Highest (38.5) importance value of *Polypogon monspeliensis* was observed in Khujari followed by the village Kakki (32.7). A sensible analysis of data pronounces that the Importance value of either *Alopecurus mysorroides* or *Polypogon monspeliensis* was higher among all prevailing weed species across the 7 surveyed locations (Table 5). The remaining weed species carried a relatively lower Importance value except *Polygonum aviculare* at village Mamashkhel possessing moderately higher value of 27.7 (Table 5). The Importance value of *Cynodon dactylon* shows that across the locations it ranged between 10.5 in Mamashkhel to 18.4 in Mandan. Although, the Importance value of this weed stayed intermediate across all the locations, but it is very clear that its growth was very consistent throughout the study area (Table 5). Our findings are in great analogy with the work of [35] who observed different communities of weeds in gram fields of Chakwal at 8 different locations. The phytosociology in the gram fields they reported partially agrees with our findings.

Table 5. *IMP of various garlic weeds species across seven location of district Bannu.*

Plants species	Kakki	Barat	Khujari	Mandan	Nurar	Surrani	Mamash khel	Average Imp valve	Spp ranking
Alopecurus mysorroides	14.5	15.2	21.8	65.1	64.7	88.5	32.3	43.1	1
Polypogon monspeliensis	32.7	17.9	38.5	0.0	1.4	0.0	15.0	15.1	2
Cynodon dactylon	15.2	15.1	14.7	18.4	17.1	11.0	10.5	14.5	3
Polygonum aviculare	13.0	16.2	10.2	0.0	1.2	0.0	27.7	9.75	4
Rumex dentatus	2.0	3.1	0.0	0.0	0.0	0.0	0.0	0.74	8

Convolvulus arvensis	3.0	8.4	10.0	1.5	3.5	0.0	6.1	4.6	6
Euphorbia heliscopia	11.0	14.2	0.0	14.2	11.4	0.0	7.0	8.2	5
Anagalis arvensis	8.5	9.0	2.0	0.0	0.0	0.0	0.0	2.81	7
Chenopodium album	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.08	10
Soncus asper	0.0	0.0	1.9	0.0	0.0	0.0	0.9	0.4	9

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