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Eco-Floristic Study of Weed Flora of Garlic Crop in District Bannu, Khyber Pakhtunkhwa, Pakistan.

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Abstract- The present research was carried out to evaluate the floristic composition and ecological characteristics of weeds flora of garlic crop. This study was directed in district Bannu, Kp, Pakistan from September 2020 to March 2021.Overall, 19 weeds belonging from 10 various families were reported from the selected garlic field of the research area, out of which only 2 (10.52%) species are monocot belongs from a family Poaceae while the remaining 17 (89.47%) species are dicots belongs from 9 different families. Asteraceae and Polygonaceaeare the leading families having 3 (15.78%) species which are trailed by Brassicaceae, Caryophyllaceae, Chenopodiaceae, Papilionaceae, and Poaceae each having 2 (10.52%) species while the remaining 3 families Convolvulaceae, Euphorbiaceae, and Ranunculaceae having 1 (5.26%) species each. In a current study,the Annual contribute 13 (68.42%) species while the biennial and perennial contributed 4 (21.05%) and 2 (10.52%) species, respectively**.**The dominant life form spectra are therophyte spectra in a current study having 15 (78.94%) species followed by Geophyte having 3 (15.78%) species and hemicryptophyte having 1 (5.26%) species. Leaf size spectra demonstrated that nanophyll and microphyll are the dominant class having 6 (31.57%) species each, followed by mesophyll having 3 (15.78%) species while the leptophyll and macrophyll having 2 (10.52%) species each. The habitat condition reveals that wet plants were dominant having 12 (63.15%) spp which is trailed by dry plants having 6 (31.57%) spp and the only 1 (5.26%) cultivated species. Seasonal variation reveals that spring has a maximum flora of 19 (100%) spp followed by Winter 9 (47.36%) spp, summer 4 (21.05%) spp, and autumn 1 (5.26%) spp. The dominant leaf type is simple leaf having 11 (57.89%) spp followed by compound and dissected leaves having 4 (21.05%) spp. Phonologically 14 (73.68%) weeds were collected in the reproductive stage while 5 (26.31%) weeds were collected in a vegetative stage. Abundance classes demonstrate that 10 (52.63%) spp are frequent, trailed by 7 (36.84%) spp which is occasional, and 2 (10.52%) spp which is abundant.

Key point: Floristic composition, Garlic, Life form spectra, Bannu, Weeds, seasonality.

I. INTRODUCTION

Weeds are a type of plant species that usually grow in domesticated crops, and compete with other valuable crops for their requirements of nutrients, water, carbon dioxide, and light[1, 2]. Weeds have special characteristics which make them more aggressive and competitive[3, 4]. They have a bad impact on the successful production of crops and require no special environmental conditions for germination. They have a fast growth rate, have great longevity of seeds that have special adaptations for dispersal. Weeds are important components of the agroecosystem to support biodiversity[5, 6]. The changes in the size of arable weed flora improved agriculture efficiency[7]. Weeds species grow in commercially important crops, they lower the quality and quantity of that crops which leads to heavy economic losses for farmers[8, 9].For fulfilling global food demand effective and sustainable weed control is required[10]. Nowadays for the successful production of various crops, the control over weeds is considered to be a prime factor[11, 12] especially at the early stages of germination the weed-crop competition is necessary to prevent which plays an essential role. Tuber crops like potato where the products are also much affected by weed-crop competition and can diminish the crop by disturbing tuber size, mass, and quality[13, 14]. If weeds are interfering at the time of harvesting or from the very start it will cause a very serious mechanical injury as a result a lot of potato tuber will be lifted in a field[15]. According to [16] research if annual weeds mixed population are allowed to compete with potatoes all over the seasons it will cause a decrease of 12% in tuber production while dry weed biomass will be increased upto 10%. The precarious period of weed elimination after the plantation of potatoes is about 4 to 6 weeks[17]. Several herbicides are used to control weed growth and can lead to the reduction of cultivars[18]. The Parthenium weed is considered to be an invasive weed in a majority of the district of Khyber

Pakhtunkhwa and Punjab which can reduce the crop yield upto 40 - 97% when left uncontrolled[19]. A very significant decrease was noticed in the production of maize crop in Pakistan as compare to other countries. It has a lot of reasons but the most probably occurring one is the weed infestation which can cause approximately 20-40% loss in production in the province of Khyber Pakhtunkhwa.[20]Reported also that if proper management were not done at a time for the removal of weeds it can cause a serious loss of 35-70% in corn grain yield. As compared to the other cultivars the production of chickpea in Pakistan was noted less due to the interference of weeds. A significant decrease of 36.8% and 41-44%, in chickpea was also determined [21]. The current research was used to explore and identify a different variety of weed species found in garlic fields and to find out the solution of weed control so that we can get a maximum yield from our field.

II. MATERIAL AND METHODOLOGY

The current study was carried out in one of the important and ancient districts (Bannu) of Khyber Pakhtunkhwa, Pakistan. Bannu is located on the northern side of KP and is bounded by Karak, Kohat, and Peshawer on the south while LakiMarwat and Dera Ismail Khan on the North. It is located between North latitude (32.43° - 33.06°) and East longitudes (70.22° to 70.57°) at an altitude of 1217 feet (371m) above the sea level. The total area covered by Bannu is 1,227 km2. Bannu is not considered to be a fertile Neider arid but is a semi-arid zone providing several plants (herbs, shrubs, trees, natural and cultivated plants). River Kurram and Tochi are the two main sources of irrigation water which fed up all the land of Bannu. Summer is hot with an average temperature of around about 36.6 ^{o}C while winter is cool with an average temperature of around about 11.7 ^{o}C.From September 2020 to March 2021 field research in a various garlic crop field was carried out to report the diversity of weeds and their numerous ecological features such as habitat, seasonality life form, and leaf size as per Raunkiaer, (1934) and Hussain (1989), life span, phenology, leaf type, and abundance classes were noted in the field. The weeds species collected from the Garlic field were pressed and dried and then becomes identified with the help of available literature and flora of Pakistan (Ali and Qaiser, 1993- 2016). The dried specimens were stocked on herbarium sheets and voucher samples were submitted in the Herbarium of Department of Botany, University of Peshawar.

Fig 1: *Map of the research area*

III. RESULT AND DISCUSSION

A total of 19 weed species belonging to 10 families were collected from various fields of garlic crop. Out of these 19 species, only 2 (10.52%) species are monocot belongs from a family Poaceae while the remaining

17 (89.47%) species are dicots belongs from 9 different families. Asteraceae and Polygonaceaeare the leading family having 3 (15.78%) species which are trailed by Brassicaceae, Caryophyllaceae, Chenopodiaceae, Papilionaceae, and Poaceae each having 2 (10.52%) species while the remaining 3 families Convolvulaceae, Euphorbiaceae, and Ranunculaceae having 1(5.26%) species each. From a maize field in district Mardan, Pakistan 29 weeds species were collected which are belonging to 15 various families in which Amaranthaceae was the leading family followed by Poaceae[22]. In a current study, Annual contribute 13 (68.42%) species while the biennial and perennial contributed 4 (21.05%) and 2 (10.52%) species respectively**.** The dominant life form spectra are therophyte spectra in a current study having 15 (78.94%) species followed by Geophyte having 3 (15.78%) species and hemicryptophyte having 1 (5.26%) species.[23] Also reported that therophytes were the dominant class. [24] While working on weeds of Kalash valley Chitral, Pakistan he reported that therophyte is the dominant life form. Leaf size spectra demonstrated that nanophyll and microphyll are the dominant class having 6 (31.57%) species each, followed by mesophyll having 3 (15.78%) species while the leptophyll and macrophyll having 2 (10.52%) species each.[23]and [25]demonstrated that microphyll is the prominent class of leaf size. The habitat condition reveals that wet plants were dominant having 12 (63.15%) spp which is trailed by dry plants having 6 (31.57%) spp and the only 1 (5.26%) cultivated species[26] classify the flora concerning habitat condition according to which the dry (45.07%) flora of Bannu is dominant over wet (34.71%) and cultivated (18.13%) flora. Seasonal variation reveals that spring has a maximum flora of 19 (100%)spp followed by Winter 9 (47.36%) spp, summer 4 (21.05%) spp, and autumn 1 (5.26%) spp.[27]also classify the total research area into 4 aspects i.e. summer, autumn, spring, and winter. [28]demonstrated that a higher number of Phyto diversity were found in summer and spring as compared to the other seasons. The dominant leaf type is simple leaf having 11 (57.89%) spp followed by compound and dissected leaves having 4 (21.05%) spp. Phonologically 14 (73.68%) weeds were collected in the reproductive stage while 5 (26.31%) weeds were collected in a vegetative stage.Abundance classes demonstrate that 10 (52.63%) spp are frequent, trailed by 7 (36.84%) spp which is occasional, and 2 (10.52%) spp which is abundant.

Table 1. *Floristic composition, seasonality, habitat, life form, leaf size, phenology, abundance classes, life span, and leaf type of Weeds of Allium sativum L. (Garlic) grown in district Bannu.*

S.No.	Divisions/Species	families	Seasonality				Habitat	Life form	Leaf size	Phenology	Abundance classes	Life span	Leaf type
			A	W	S	Sm							
	A. Monocot												
1.	*Alopecurus mysorroides* L.	Poaceae	×	×	✓	×	W	Th	Mac	R	A	An	S
2.	*Polypogonmonspeliensis*(L.) Desf.	Poaceae	×	×	✓	×	W	Th	Mes	R	A	An	S
	B. Dicot												
3.	*Anagalis arvensis* L.	Caryophyllaceae	×	×	✓	×	W	Th	L	R	F	An	S
4.	*Brassica campestris* L.	Brassicaceae	×	✓	✓	×	C	Th	Mac	R	O	P	S
5.	*Chenopodium album* L.	Chenopodiaceae	×	✓	✓	×	D	Th	N	R	F	An	Dis
6.	*Convolvulus arvensis* L.	Convolvulaceae	×	✓	✓	×	D	Th	Mic	R	O	P	S
7.	*Conyza canadensis* (L.) Cronquist	Asteraceae	×	×	✓	×	D	Th	Mic	V	O	An	Dis
8.	*Cronopusdidymus*(L.) Sm.	Brassicaceae	×	✓	✓	×	W	Th	L	R	F	B	Com
9.	*Euphorbia heliscopia*L.	Euphorbiaceae	×	×	✓	×	D	Th	Mic	R	O	An	S
10.	*Matricariachamomila* L.	Asteraceae	×	×	✓	×	W	Th	Mic	R	O	An	Com
11.	*Melilotus officinalis* (L.)Pall.	Papilionaceae	×	×	✓	✓	D	Th	N	R	F	B	S

12.	*Polygonum aviculare*L.	Polygonaceae	×	✓	✓	×	W	Th	N	R	F	An	S
13.	*Polygonum plebium*L.	Polygonaceae	×	✓	✓	×	W	Th	N	V	F	An	S
14.	*Ranunculus muricatus* L.	Ranunculaceae	×	×	✓	✓	W	G	Mic	R	F	An	Dis
15.	*Rumex dentatus*L.	Polygonaceae	×	×	✓	✓	W	G	Mes	V	F	B	S
16.	*Soncus asper* (L.) Hill.	Asteraceae	×	✓	✓	×	W	Th	Mes	R	F	B	Dis
17.	*Spergula arvensis* L.	Caryophyllaceae	×	×	✓	×	W	Th	N	R	F	An	Com
18.	*Suaedafruticosa*Forssk	Chenopodiaceae	✓	✓	✓	✓	D	H	N	V	O	An	S
19.	*Trifolium resupinatum* L.	Papilionaceae	×	✓	✓	×	W	G	Mic	V	O	An	Com

Key: (a) Wet (W), (b) Dry (D), Cultivated (C)

(a) Hemicryptophyte (H). (b) Geophyte (G). (c) Therophytes (Th)
(b) Simple (S), (b) Compound (Com), (c) Dissected (Dis).
(a) Mesophyll (Mes), (b) microphyll (Mic), (c)Nanophyll (N), (d)Leptophyll (L), (e) Macrophyll (Mac).
(b) Reproductive (R), (b) vegetative (V)
(a) Frequent (F), (b) abundant (A), (c) Occasional (O).
(a) Annual (An), (b) Biennial (B), (c) Perennial (P).

Table 2. *Summery classes of habitat, life form, leaf size, phonological stages, abundance classes, life span, and leaf type of weeds of Allium sativum L. (Garlic) grown in district Bannu***.**

S. No.	**Parameters**	**No. of species**	**Percentage**
	Habitat classes		
1. 2. 3.	Cultivated Dry Wet	1 6 12	5.26 31.57 63.15
Total		**19**	**99.98**
	Life form		
1. 2. 3.	Hemicryptophyte Geophyte Therophyte	1 3 15	5.26 15.78 78.94
Total		**19**	**99.98**
	Leaf size		
1. 2. 3. 4. 5.	Leptophyll Macrophyll Mesophyll Nanophyll Microphyll	2 2 3 6 6	10.52 10.52 15.78 31.57 31.57
Total		**19**	**99.96**
	Phenological stages		
1. 2.	Vegetative Reproductive	5 14	26.31 73.68
Total		**19**	**99.99**
	Abundance classes		

1. 2. 3.	Abundant Occasional Frequent	2 7 10	10.52 36.84 52.63
Total		**19**	**99.99**
	Life span		
1. 2. 3.	Perennial Biennial Annual	2 4 13	10.52 21.05 68.42
Total		**19**	**99.99**
	Leaf type		
1. 2. 3.	Compound Dissected Simple	4 4 11	21.05 21.05 57.89
Total		**19**	**99.99**

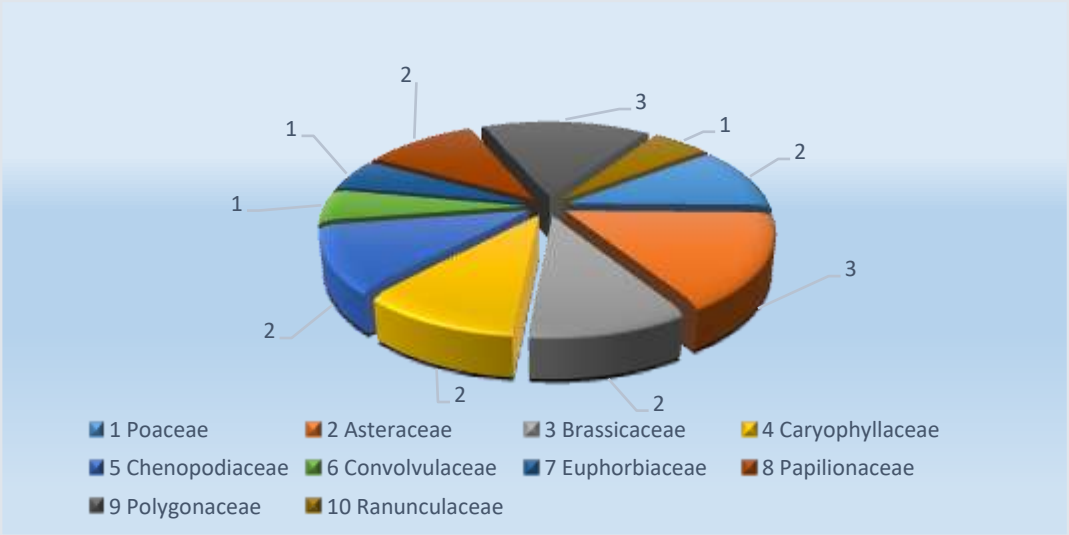

Fig 2. *Family distribution of weeds of garlic.*

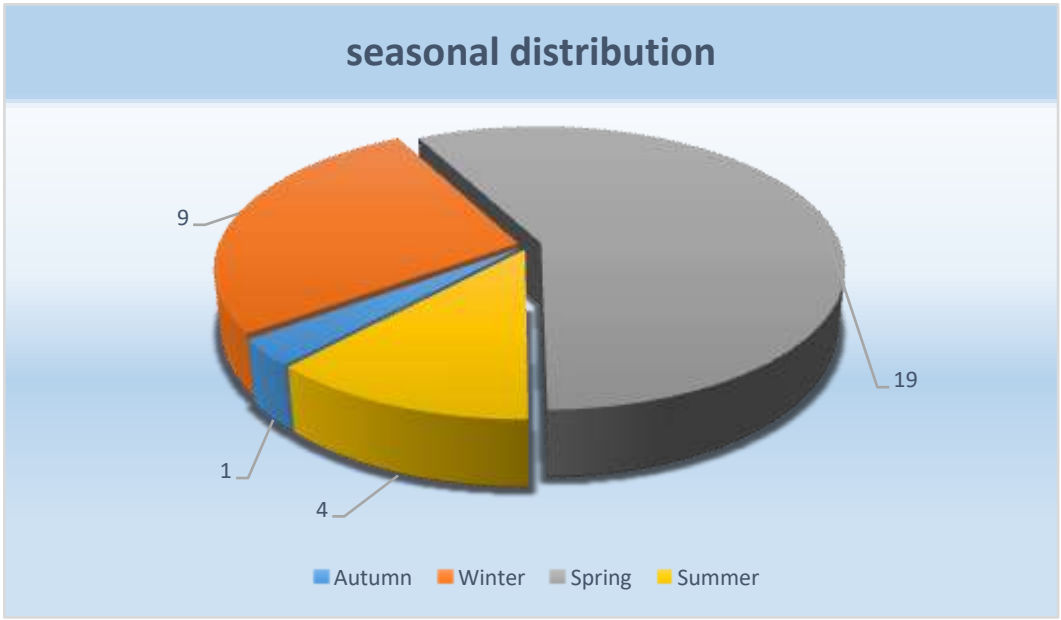

Fig 3. *Seasonal distribution of weeds of Garlic.*

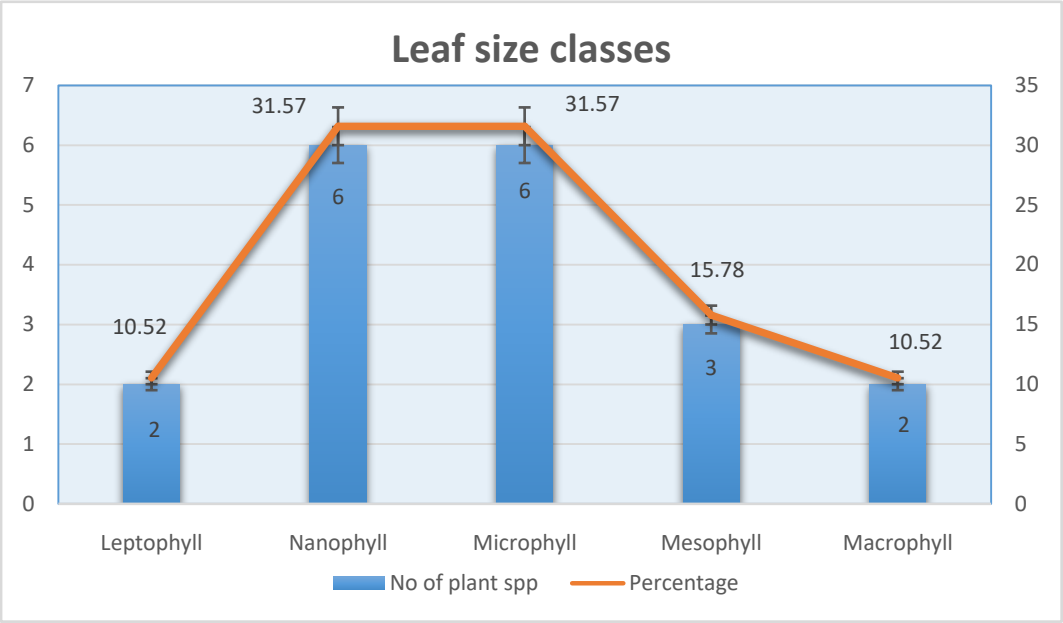

Fig 4. *Leaf size classes of weeds of Garlic.*

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