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WEEDS AS VIABLE HABITAT FOR ARTHROPOD SPECIES IN CROPLANDS OF CENTRAL PUNJAB

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Weeds are considered a limiting factor of crop production. Simultaneously, these non-crop plants are a portion of the agricultural ecosystem and play an essential role as viable habitat for many organisms, including bio-control agents. Utilizing the quadrate method, sugarcane, fodder, wheat and mustard croplands were sampled for one year to determine the weed flora and arthropods living among it. Twenty weed species and eight major arthropod orders were found to be present. The majority of the weed plants were broad-leaved, while some were grass-like. A review of literature on Central Punjab weeds uncovered depicted a considerable change in the weed flora over few decades. This could be related to the intensive and extensive farming in the area, which has this increased over the few decades along with the construction of an extensive irrigation canal system. These alterations may have caused drastic changes in the soil structure and climate of the region. Most of the phytophagous arthropod species used weed plants as food. In turn, these were fed upon by a few zoophagous arthropod species that also utilized the weeds for shelter and oviposition. Thus, weeds have a specific role within the agro-ecosystem by supporting local biodiversity.

Keywords: Arthropods, weeds, phytophagous, herbivore

INTRODUCTION

Weeds are generally considered undesirable plant species that interfere with crop plants but actually they have functional importance within agro-ecosystems. They provide floral diversity, and surely increase photosynthesis in the area. Arable weed species support a high diversity of insect species. Reduction or extinction of such associated insects or other taxa may cause perturbation, resulting in a pest outbreak in the absence of natural and potential predator taxa (Marshall *et al.*, 2001). Weeds also provide alternate resources for phytophagous insects and indirectly serve beneficial zoophagous arthropod species when their preferred crop plants are absent (Norris and Kogan, 2005). Phytomorphic heterogeneity provides greater diversity of potential niches for organisms in the cropland by increasing diversification and its influence on beneficial insects. Moreover, weeds are also used by phytophagous species diluting herbivory on crop plants (Capinera, 2005).

Diversification of an agro-ecosystem by traditional means helps increasing the diversity by reducing the damage to crops by phytophagous species because of interspecific competition among pest and non-pest species and improved natural prey-predator balance. Careful observations regarding organisms associated with these plants provide information about the sustainability of the cropping system **(**Hyvonen and Huusela-Veistola, 2008**)**. Weeds can also be used as indicator of health of an agro-ecosystem (Siddiqui, 2005). Weeds also have a positive impact on the sub-surface microbial biomass and especially on mycorrhizal fungi thus increasing the crop's nutrient uptake efficiency (Douds and Millner, 1999).

Traditionally maintained vegetation patches support higher weed populations and where such patches are present; they are colonized by many arthropods. The response of arthropod groups to vegetation cover (bare ground, litter, crop cover, broadleaf weed cover and grass cover) is very important in studying a sustainable crop system, its faunal community composition and components of the vegetation. Even where weed cover was relatively low, some relationships between arthropods and vegetation were also seen (Johnson *et al.,* 1996). Addressing a few of the above roles of weeds in different crops the research was focused to identify major weed species associated with major crops of the area, to identify faunal species associated with weed plants and role of these faunal species in the crop.

MATERIALS AND METHODS

Based on different cropping patterns and agro climatic conditions, cultivations in Punjab are classified into different zones. One such zone is Mixed-crop zone and it constitutes vast area (2.6 million hectares) of Central Punjab where pesticidal applications are relatively less frequent due to cultivation of food and fodder crops. The flora and fauna of this zone are suspected to be affected little due to

comparatively lesser use of chemicals and smaller land holdings. One year study was conducted in sugarcane, fodder, wheat and mustard crops. Various cropland localities around the peripheral area of Central Punjab were selected randomly. At each locality two acres each of the available crop of sugarcane, fodder, wheat and mustard were randomly selected. Fauna associated with the weed plants were collected by quadrate method. Three 1 x 1 m quadrates were sampled in each acre.

All the arthropods visible to naked eyes were collected from the weeds included immature and adults whether sitting, moving or residing (sticking on the foliage or stem) on weed plants within the cropland. Sampled specimens were kept in properly labeled vials containing laboratory grade alcohol with few drops of glycerine. Sampling was made by hand picking, hand net and automated sifters (60 sec) per quadrate. The respective weed plants were also preserved for later identification.

For identification of weed species "Flora of Pakistan" by Cope *et al.,* (1982) was consulted. Faunal identification was done with the help of available, related taxonomic information in "Fauna of British India" and online keys available on different websites. Museum of the Department of Agri. Entomology, University of Agriculture, Faisalabad and Entomological Research Institute Jhang road Faisalabad was also consulted. The trophic levels of each species (phytophagous, zoophagous and saprophagous) were confirmed with the help of recent available literature on internet. Canonical correspondence analysis was employed to get various inferences about preferences of various weed species by arthropods. The software was applied using Canoco Computer Package for Windows (version 4.5).

RESULTS

A total of twenty weed species were reported, twelve were broad leaved while eight were grassy weeds. The species recorded were *Anagalis arvensis, Anethum graveolens, Chenopodium album, Cenchrus setigerus, Cichorium intybus, Cnicus arvensis, Convolvulus arvensis, Conyza boneriensis, Coronopus didymus, Cynodon dactylon, Dichanthium annulatum, Fumaria indica, Melilotus indica, Malvastrum coromandelianum, Phalaris minor, Parthenium hysterophorus, Rumex dentatus, Saccharum bengalense, Sonchus oleraceous* and *Vaccaria hispanica*. Of these fifteen species were observed in sugarcane, eight in fodder, six in wheat and four in mustard crop (Table 1). Different faunal species (arthropods) were collected from these weeds.

***Canonical Correspondence Analysis (CCA)*:** In ecology, habitat plays a major role in designing the structure of a community. CCA analysis was used to determine the degree of association between faunal and floral species. The stability and sustainability of an agro-ecosystem seems to be dependant on such associations.

Table 1. Summary of weed species reported from four crops of Central Punjab

Weed species	Sugarcane	Fodder	Wheat	Mustard	Category
Anagalis arvensis	*	*	*		B
Anethum graveolens	*				B
Chenopodium album	*	*			B
Cenchrus setigerus		*			B
Cichorium intybus			*	*	G
Cnicus arvensis	*	*			B
Convulvulus arvensis	*				B
Conyza boneriensis	*				B
Coronopus didymus	*	*			B
Cynodon dactylon	*	*	*		G
Dichanthium annulatum	*				G
Fumaria indica				*	B
Melilotus indica	*	*			B
Malvastrum coromandelianum	*				B
Phalaris minor	*	*	*		G
Parthenium hysterophorus	*			*	G
Rumex dentatus	*		*		B
Saccharum bengalense	*				G
Sonchus oleraceous				*	G
Vaccaria hispanica			*		G
Total weed species present in each crop	15	8	6	4	

* = Present, B= Broad leaved, G= Grassy

***Sugarcane weeds*:** Figure 1 shows CCA for the arthropods associated with fifteen weeds of sugarcane field. The length of an arrow showed the strength of association. A strong association of some arthropods with the weeds namely, *S. bengalense, D. annulatum, M. indica* and *A. graveolens* was observed. The species associated with *S. bengalense* were *Cheriacanthium vire, Oxyopes sertatus, Oxyopes spp., Clubiona phragmitus, Solenopsis invicta, S. xyloni,* and *Camponotus pennsylvanicus* among the predators while *Helicoverpa zea, Xysticus atrimaculatus, Dysdercus mimulus, Anopheles spp., A. stephensii,* and *Culex pipiens* were among the preys/pests. Only a single species *C. carnea* was associated with *D. annulatum.* Similarly the species associated with *M. indica* were *Adalia punctata* the only single predator while *Coreidae nymph, Lygaeus lineolaris, L. triticus, Lygaeus spp., Bagrada hilaris* and *Aphis gossypii* among preys/pests. The species associated with *A. graveolens* were *Attrecus affinus, Calliphora vicina, Apis dorsata, Oonops spp.,* and *Misummena menoka* among predators while *Tanymecus palliates, Rhopalosiphum padi* and *Orbellia orbellia* among preys/pests.

***Fodder weeds*:** Figure 2 shows CCA for the arthropods associated with eight weeds of fodder field. But a strong association of some arthropods with the weeds namely, *C. album, C. arvensis, C. didymus, A. arvensis* and *C. setigerus* was observed. The species associated with *C. album* were *Acheta domesticus, Tetrix subulata,* and *Schistocerca rubiginosa*. Similarly the species associated with *C. arvensis* and *C. didymus* were *Coccinella larvae, Camponotus sayi, C. pennsylvanicus, Formica spp.* among predators while *D. singulatus, D. mimulus, D. calmii, Schizaphis graminum,* and *A. stephensii* among preys/pests. Interestingly only two predator species *Chrysoperla carnea* and *C. viridiana* were associated with *A. arvensis* and *C. setigerus*.

***Wheat weeds*:** Figure 3 shows CCA for the arthropods associated with six weeds of wheat field. A strong association of some arthropods with the weeds namely, *P. minor, A. arvensis,* and *R. dentatus* was observed. Only a single species *C. pennsylvanicus* was associated with *P. minor.* While the species associated with *A. arvensis* were *Episyrphus baltaetus, Califora vicina, Syrphus ribessi, Anopheles spp., A. stephensii, Dipterous larvae, Musca domestica, O. orbellia* and *C. pipiens.* Similarly the species associated with *R. dentatus* were *Camponotus spp., C. sayi, Solenopsis invicta, S. xyloni, Formica spp., F. rufa, Apis dorsata* and *C. carnea* among predators while *L. brassicae* and *X. atrimaculatus* among the preys/pests.

***Mustard weeds*:** Figure 4 shows CCA for the arthropods associated with four weeds of mustard field. But a strong association of some arthropods with the weeds namely, *C. intybus, S. oleraceous,* and *P. hysterophorus* was observed. The species associated with *C. intybus* were *Paederus littoralis, A. puctata, Brumoides suturalis, Cheilomenes sexmaculata, Micraspis allardi, F. rufa, C. sayi,* and *S. xyloni.* Similarly the species associated with *S. oleraceous* were *E. baltaetus, Dipterous larvae, A. maculates* among preys/pests while *Formica spp., S. invicta, Camponotus spp.* and *C. pennsylvanicus* among predators. The species showing association with *P. hysterophorus* were *Acrididae nymph, Acrida ungarica, Tetrix subulata, T. brunneri, A. gossypii, Pentatomidae nymph, S. graminum, Mayetiola destructor, D. singulatus, D. calmii, D. mimulus* and *E. servus.* All were the known pest of different crops.

DISCUSSION

Weeds are generally considered as competitors of crop plants but there is another view point that they add phytomorphic heterogeneity which sustains many arthropod species including beneficial bio-control agents. They also provide food to phytophagous insects and help neutralizing the potential pest attack. Moreover, weed seeds are food of many granivorous birds. In this way weeds play an important role in structure of a crop system (Newton, 2004). Present study is an attempt to assess the positive role of various weeds occurring along with four major crop plantations.

Many agricultural studies have shown significant yield increases in diverse cropping systems. Ecological studies suggested that more diverse plant communities are more resistant to disturbance and more resilient in the face of environmental perturbation (Alteiri and Nicholls, 1999). In the present study twenty weed species were identified from selected crops of Central Punjab, of which eight were grassy. Whereas, Ashiq *et al.* (2003) has reported nearly 50 weed species in the cropland of Punjab of which ten were grassy. The presence of grassier weed species especially wide spread of *Phalaris minor* instead of *Vicia sativa* in our study area is an indication of changed condition of soil from light sandy to loamy. The application of fertilizers and canal irrigation in the fields are among the major factor changing soil conditions. In addition the farming practices and tillage also has a great impact on weed flora (Siddiqui, 2005).

Four weeds viz. *S. bengalense, D. annulatum, M. indica* and *A. graveolens* were significantly preferred by many important pests as well as predator species. Generalist predators such as spiders and hymenopterans and some preys/pests showed their affinities with these weeds in sugarcane. Similarly five weeds viz. *C. album, C. arvensis, C. didymus, A. arvensis* and *C. setigerus* were preferred by important pest and predators in fodder. Beetles and green lace wing showed their affinities with these weeds in fodder. Three weeds viz. *C.intybus, A. arvensis,* and *R. dentatus* were significantly preferred by many important pests of the cropland in wheat. The frequently occurring wheat weeds *P.*

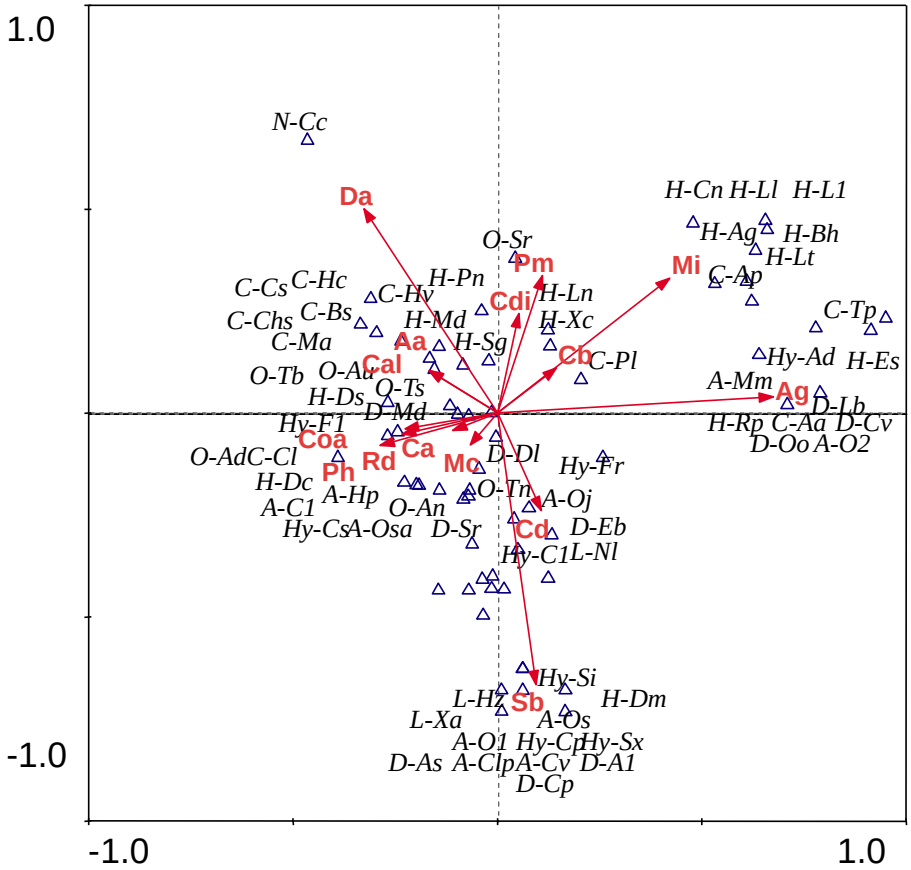

Figure 1. CCA ordination showing the distribution of arthropod species on different weed of sugarcane crop in Central Punjab

[*Anagalis arvensis* (Aa), *Anethum graveolens* (Ag), *Chenopodium album* (Cal), *Cnicus arvensis* (Ca), *Convolvulus arvensis* (Coa), *Conyza boneriensis* (Cb), *Coronopus didymus* (Cdi), *Cynodon dactylon* (Cd), *Dichanthium annulatum* (Da), *Malvastrum coromandelianum* (Mc), *Melilotus indica* (Mi), *Parthenium hysterophorus* (Ph), *Phalaris minor* (Pm), *Rumex dentatus* (Rd), *Saccharum bengalense* (Sb)]

[Order Araneae- *Oxyopes sertatus* (A-Os), *Oxyopes javanus* (A-Oj), *Oxyopes* sp1 (A-O1), *Oxyopes saradae* (A-Osa), *Oonops* sp. (A-O2), *Cheriacanthium vire* (A-Cv), *Cheriacanthium* sp. (A-C1), *Holocnemes pluchei* (A-Hp), *Clubiona phragmitus* (A-Clp), *Misummena menoka* (A-Mm), Order Orthoptera- *Acrididae* nymph (O-An), *Acheta domesticus* (O-Ad), *Tettigonidae* nymph (O-Tn), *Tetrix subulata* (O-Ts), *Tetrix brunneri* (O-Tb), *Acrida ungarica* (O-Au), *Schistocerca rubiginosa* (O-Sr), Order Hemiptera- *Euschistus servus* (H-Es), *Xyonysius californicus* (H-Xc), *Lygaeus tricicus* (H-Lt), *Lygaeidae nymph* (H-Ln), *Lygaeus sp.* (H-L1), *Lygaeus lineolaris* (H-Ll), *Coridae nymph* (H-Cn), *Bagrada hilaris* (H-Bh), *Mayetiola destructor* (H-Md), *Dysdercus singulatus* (H-Ds), *Dysdercus calmii* (H-Dc), *Dysdercus mimulus* (H-Dm), *Schizaphis graminum* (H-Sg), *Aphis gossypii* (H-Ag), *Pentatomidae nymph* (H-Pn), *Rhopalosiphum padi* (H-Rp), Order Coleoptera- *Coccinella septumpuctata* (C-Cs), *Coccinella larvae* (C-Cl), *Cheilomenes sexmaculata* (C-Chs), *Hippodemia convergens* (C-Hc), *Hippodemia variegate* (C-Hv), *Paederus littoralis* (C-Pl), *Brumoides suturalis* (C-Bs), *Micraspic allardi* (C-Ma), *Adalia punctata* (C-Ap), *Attrecus affinus* (C-Aa), *Tanymecus palliates* (C-Tp), Order Lepidoptera- *Helicoverpa zea* (L-Hz), *Noctuidae larvae* (L-Nl), *Xysticus atrimaculatus* (L-Xa), Order Diptera- *Dipterous larvae* (D-Dl), *Syrphus ribessi* (D-Sr), *Culex pipiens* (D-Cp), *Anopheles stephensi* (D-As), *Anopheles sp.* (D-A1), *Episyrphus baltaetus* (D-Eb), *Musca domestica* (D-Md), *Orbellia orbellia* (D-Oo), *Calliphora vicina* (D-Cv), *Liriomyza brassicae* (D-Lb), Order Hymenoptera- *Formica spp.* (Hy-F1), *Formica rufa* (Hy-Fr), *Camponotus sayi* (Hy-Cs), *Camponotus spp.* (Hy-C1), *Camponotus pennsylvanicus* (Hy-Cp), *Solenopsis xyloni* (Hy-Sx), *Solenopsis invicta* (Hy-Si), *Apis dorsata* (Hy-Ad), Order Neuroptera- *Chrysoperla carnea* (N-Cc)]

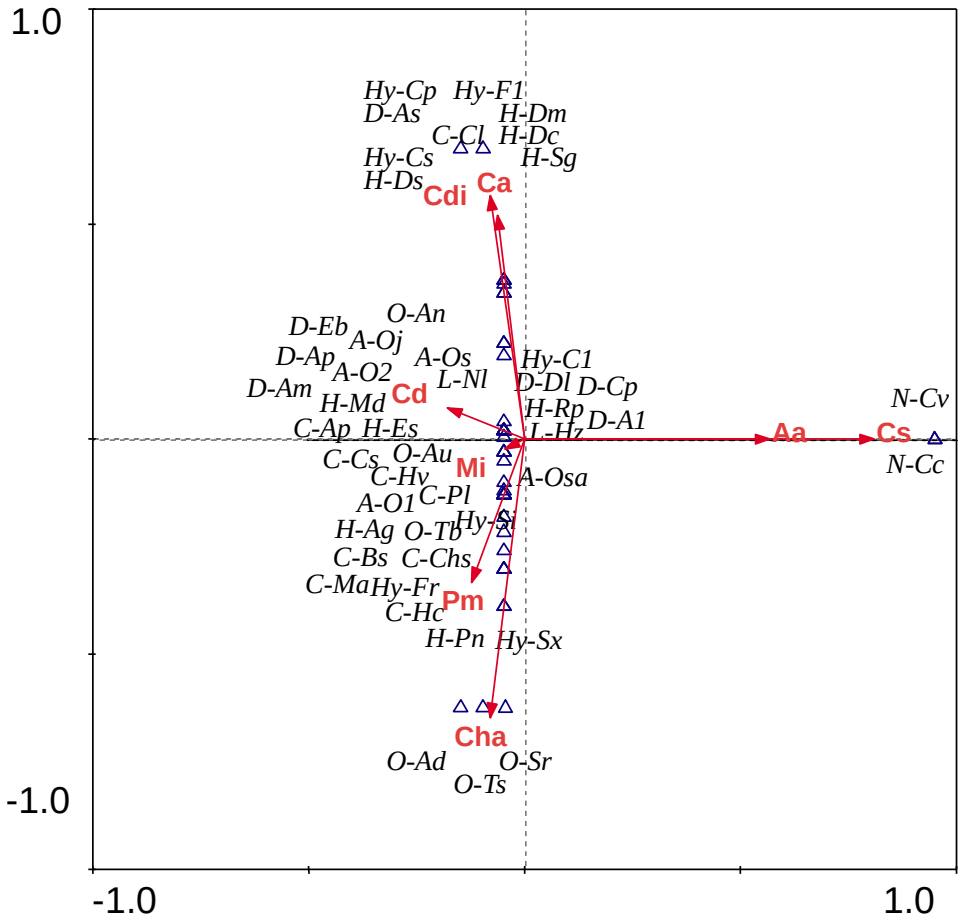

Figure 2. CCA ordination showing the distribution of arthropod species on different weed of fodder crop in Central Punjab

[*Anagalis arvensis* (Aa), *Cenchrus setigerus* (Cs), *Chenopodium album* (Cha), *Cnicus arvensis* (Ca), *Coronopus didymus* (Cdi), *Cynodon dactylon* (Cd), *Melilotus indica* (Mi), *Phalaris minor* (Pm),]

[Order Araneae- *Oxyopes sertatus* (A-Os), *Oxyopes javanus* (A-Oj), *Oxyopes* sp1 (A-O1), *Oxyopes saradae* (A-Osa), *Oonops* sp. (A-O2), Order Orthoptera- *Acrididae* nymph (O-An), *Acheta domesticus* (O-Ad), *Tetrix subulata* (O-Ts), *Tetrix brunneri* (O-Tb), *Acrida ungarica* (O-Au), *Schistocerca rubiginosa* (O-Sr), Order Hemiptera- *Euschistus servus* (H-Es), *Mayetiola destructor* (H-Md), *Dysdercus singulatus* (H-Ds), *Dysdercus calmii* (H-Dc), *Dysdercus mimulus* (H-Dm), *Schizaphis graminum* (H-Sg), *Aphis gossypii* (H-Ag), *Pentatomidae nymph* (H-Pn), *Rhopalosiphum padi* (H-Rp), Order Coleoptera- *Coccinella septumpuctata* (C-Cs), *Coccinella larvae* (C-Cl), *Cheilomenes sexmaculata* (C-Chs), *Hippodemia convergens* (C-Hc), *Hippodemia variegate* (C-Hv), *Paederus littoralis* (C-Pl), *Brumoides suturalis* (C-Bs), *Micraspic allardi* (C-Ma), *Adalia punctata* (C-Ap), Order Lepidoptera- *Helicoverpa zea* (L-Hz), *Noctuidae larvae* (L-Nl), Order Diptera- *Dipterous larvae* (D-Dl), *Culex pipiens* (D-Cp), *Anopheles stephensi* (D-As), *Anopheles sp.* (D-A1), *Anopheles peditaeniatus* (D-Ap), *Anopheles maculates* (D-Am), *Episyrphus baltaetus* (D-Eb), Order Hymenoptera- *Formica spp*. (Hy-F1), *Formica rufa* (Hy-Fr), *Camponotus sayi* (Hy-Cs), *Camponotus spp*. (Hy-C1), *Camponotus pennsylvanicus* (Hy-Cp), *Solenopsis xyloni* (Hy-Sx), *Solenopsis invicta* (Hy-Si), Order Neuroptera- *Chrysoperla carnea* (N-Cc), *Chrysopa viridiana* (N-Cv)]

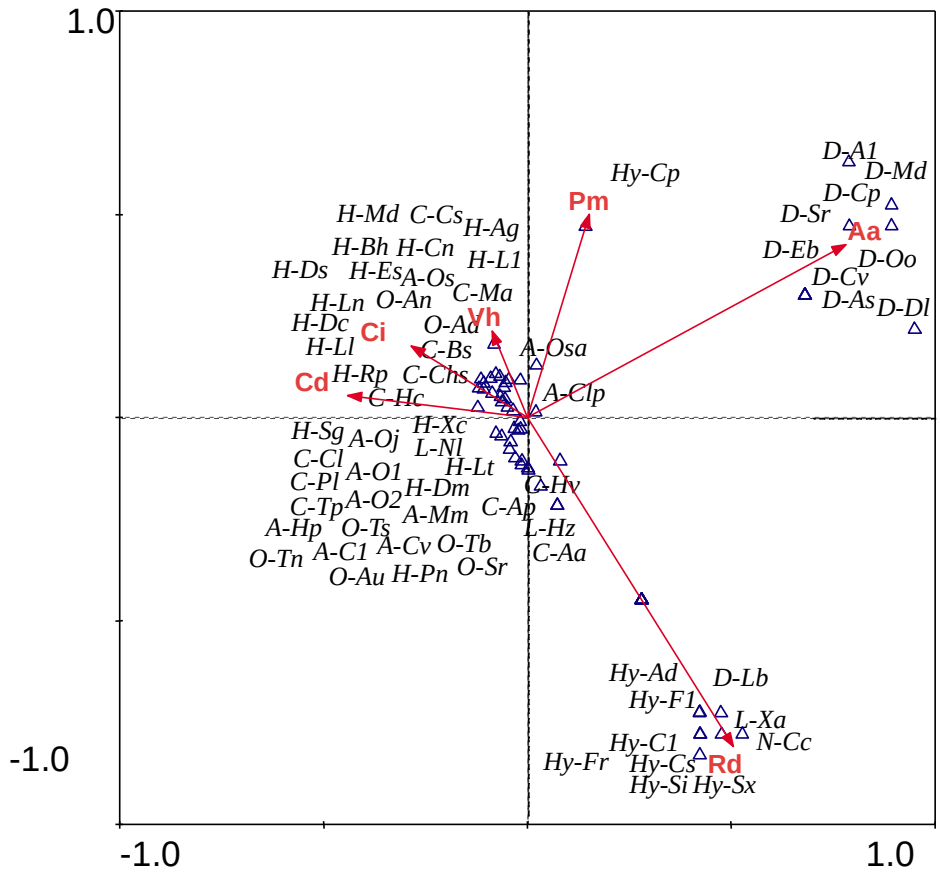

Figure 3. CCA ordination showing the distribution of arthropod species on different weed of wheat crop in Central Punjab

[*Anagalis arvensis* (Aa), *Cichorium intybus* (Ci), *Phalaris minor* (Pm), *Cynodon dactylon* (Cd), *Rumex dentatus* (Rd), *Vaccaria hispanica* (Vh),]

[Order Araneae- *Oxyopes sertatus* (A-Os), *Oxyopes javanus* (A-Oj), *Oxyopes* sp1 (A-O1), *Oxyopes saradae* (A-Osa), *Oonops* sp. (A-O2), *Cheriacanthium vire* (A-Cv), *Cheriacanthium sp*. (A-C1), *Holocnemes pluchei* (A-Hp), *Clubiona phragmitus* (A-Clp), *Misummena menoka* (A-Mm), Order Orthoptera- *Acrididae* nymph (O-An), *Acheta domesticus* (O-Ad), *Tettigonidae* nymph (O-Tn), *Tetrix subulata* (O-Ts), *Tetrix brunneri* (O-Tb), *Acrida ungarica* (O-Au), *Schistocerca rubiginosa* (O-Sr), Order Hemiptera- *Euschistus servus* (H-Es), *Xyonysius californicus* (H-Xc), *Lygaeus tricicus* (H-Lt), *Lygaeidae nymph* (H-Ln), *Lygaeus sp.* (H-L1), *Lygaeus lineolaris* (H-Ll), *Coridae nymph* (H-Cn), *Bagrada hilaris* (H-Bh), *Mayetiola destructor* (H-Md), *Dysdercus singulatus* (H-Ds), *Dysdercus calmii* (H-Dc), *Dysdercus mimulus* (H-Dm), *Schizaphis graminum* (H-Sg), *Aphis gossypii* (H-Ag), *Pentatomidae nymph* (H-Pn), *Rhopalosiphum padi* (H-Rp), Order Coleoptera- *Coccinella septumpuctata* (C-Cs), *Coccinella larvae* (C-Cl), *Cheilomenes sexmaculata* (C-Chs), *Hippodemia convergens* (C-Hc), *Hippodemia variegate* (C-Hv), *Paederus littoralis* (C-Pl), *Brumoides suturalis* (C-Bs), *Micraspic allardi* (C-Ma), *Adalia punctata* (C-Ap), *Attrecus affinus* (C-Aa), *Tanymecus palliates* (C-Tp), Order Lepidoptera- *Helicoverpa zea* (L-Hz), *Noctuidae larvae* (L-Nl), *Xysticus atrimaculatus* (L-Xa), Order Diptera- *Dipterous larvae* (D-Dl), *Syrphus ribessi* (D-Sr), *Culex pipiens* (D-Cp), *Anopheles stephensi* (D-As), *Anopheles sp.* (D-A1), *Episyrphus baltaetus* (D-Eb), *Musca domestica* (D-Md), *Orbellia orbellia* (D-Oo), *Calliphora vicina* (D-Cv), *Liriomyza brassicae* (D-Lb), Order Hymenoptera- *Formica spp*. (Hy-F1), *Formica rufa* (Hy-Fr), *Camponotus sayi* (Hy-Cs), *Camponotus spp.* (Hy-C1), *Camponotus pennsylvanicus* (Hy-Cp), *Solenopsis xyloni* (Hy-Sx), *Solenopsis invicta* (Hy-Si), *Apis dorsata* (Hy-Ad), Order Neuroptera- *Chrysoperla carnea* (N-Cc)]

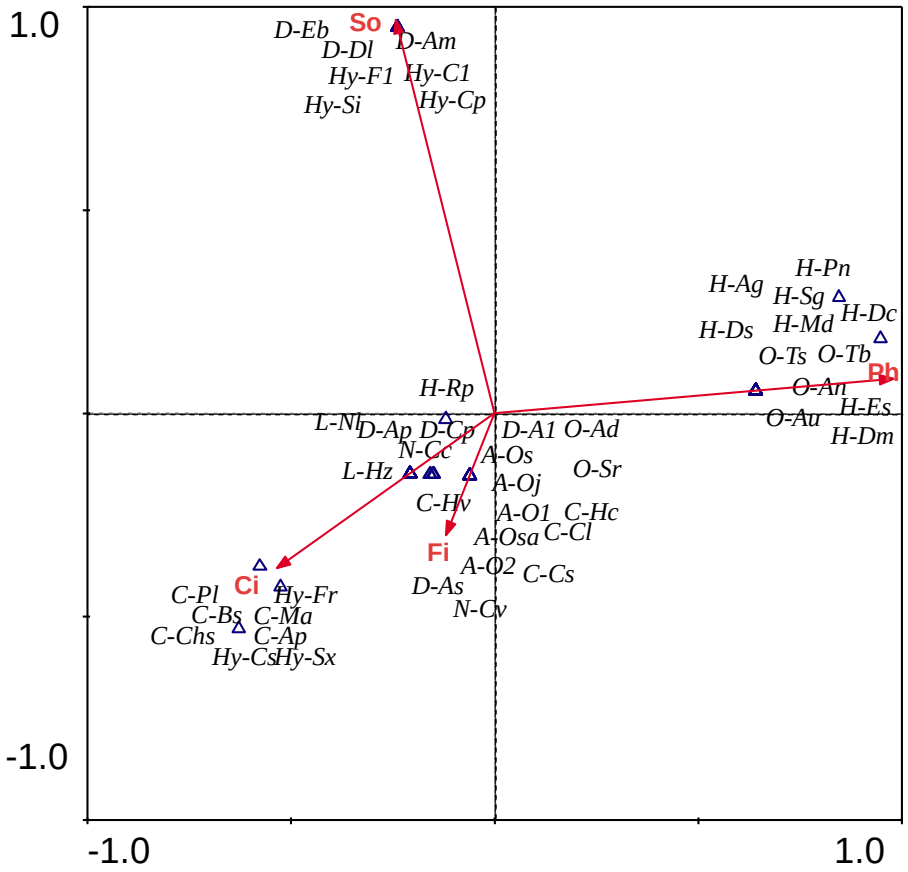

Figure 4. CCA ordination showing the distribution of arthropod species on different weed of mustard crop in Central Punjab

[*Cichorium intybus* (Ci), *Fumaria indica* (Fi), *Parthenium hysterophorus* (Ph), *Sonchus oleraceous* (So)]

[Order Araneae- *Oxyopes sertatus* (A-Os), *Oxyopes javanus* (A-Oj), *Oxyopes sp*1 (A-O1), *Oxyopes saradae* (A-Osa), *Oonops sp*. (A-O2), Order Orthoptera- *Acrididae* nymph (O-An), *Acheta domesticus* (O-Ad), *Tetrix subulata* (O-Ts), *Tetrix brunneri* (O-Tb), *Acrida ungarica* (O-Au), *Schistocerca rubiginosa* (O-Sr), Order Hemiptera- *Euschistus servus* (H-Es), *Mayetiola destructor* (H-Md), *Dysdercus singulatus* (H-Ds), *Dysdercus calmii* (H-Dc), *Dysdercus mimulus* (H-Dm), *Schizaphis graminum* (H-Sg), *Aphis gossypii* (H-Ag), *Pentatomidae nymph* (H-Pn), *Rhopalosiphum padi* (H-Rp), Order Coleoptera- *Coccinella septumpuctata* (C-Cs), *Coccinella larvae* (C-Cl), *Cheilomenes sexmaculata* (C-Chs), *Hippodemia convergens* (C-Hc), *Hippodemia variegate* (C-Hv), *Paederus littoralis* (C-Pl), *Brumoides suturalis* (C-Bs), *Micraspic allardi* (C-Ma), *Adalia punctata* (C-Ap), Order Lepidoptera- *Helicoverpa zea* (L-Hz), *Noctuidae larvae* (L-Nl), Order Diptera- *Dipterous larvae* (D-Dl), *Culex pipiens* (D-Cp), *Anopheles stephensi* (D-As), *Anopheles sp.* (D-A1), *Anopheles peditaeniatus* (D-Ap), *Anopheles maculates* (D-Am), *Episyrphus baltaetus* (D-Eb), Order Hymenoptera- *Formica spp*. (Hy-F1), *Formica rufa* (Hy-Fr), *Camponotus sayi* (Hy-Cs), *Camponotus spp*. (Hy-C1), *Camponotus pennsylvanicus* (Hy-Cp), *Solenopsis xyloni* (Hy-Sx), *Solenopsis invicta* (Hy-Si), Order Neuroptera- *Chrysoperla carnea* (N-Cc), *Chrysopa viridiana* (N-Cv)]

minor has been observed to harbour green lace wing, *Chrysoperla carnea* in good number in a wheat field attacked by aphids (Rana, 2007 Personal communication). Similarly three weeds *C. intybus*, *S. oleraceous*, and *P. hysterophorus* were preferred by coccinellid predators and important crop pests in mustard.

Majority of the phytophagous species were found to be suspected weed feeder thus releasing the burden on crop. Rest of the species belonged to higher trophic guild also share weeds as provision of cover, reproduction sites and structure within the crop system as indicated by (Brown and Hyman, 1995). The predator species are of particular

importance in maintaining natural predator-prey balance in the cropland. Outstanding diversity and abundance of different predator groups could be interpreted in term of their high resistant power against a specific type of stress. Araneae, Coleoptera and some Hymenoptera predators were the best example of this trend which shared fairly in the sample. Their existence could be interpreted in the light of findings of Feber *et al.* (1998) who concluded that the abundance and diversity of these taxa was directly affected by the increased levels of under story vegetation in the crop fields.

C. album, *A. arvensis*, *R. dentatus* and *F. indica* had a record of supporting 31, 50, 8 and 3 species of insects respectively **(**Marshall *et al.,* 2003). Similarly in present study first three weed were found to support different arthropod species in the croplands. The weed species of family Polygonaceae and Chenopodiacea are part of food items for birds (Buxton *et al.,* 1998). Whereas, insects constituted 42% of the food items taken by little spotted owl (*Athene bramalso*) and 33% of small indian mongoose (*Herpestes auropunctatus*) in the cropland of district Sheikhupura and Faisalabad (Mushtaq-ul-Hassan *et al.,* 2003; Rana *et al.,* 2005). Thus weeds and their fauna are playing a key role in stability of an agro-ecosystem.

CONCLUSION

Weeds are important component of crop system as they enhance the floral diversity. They are used by many pest and predator species as alternate food source, breeding site and shelter. Certainly they play a very positive role as life source for many phytophagous and zoophagous taxa.

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