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Survey Of Weed Flora In Kazaure Agricultural Zone Of Jigawa State, Nigeria

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Abstract: ***A survey of weed flora in Kazaure Agricultural zone of Jigawa State (Latitude 12^0 $6^{'}$ N, longitude 8^o $4^{'}$ E and 412m above the sea level) was conducted in 2017 wet season. The objective of the study was to generate a checklist of the predominant weeds in the study area which will assist in mapping out control measures of the identified weed species. A total of 15 farms, each of sorghum/cowpea, millet/cowpea and sesame/cowpea mixture were randomly selected based on their status of intensive cultivation. The farms were located at Kazaure, Roni and Sule-tankarkar towns, respectively. Weed species were collected using quadrate sampling techniques over a period of three months from July to September in 2017 cropping season across the zone and used for weed sampling and identification. The survey revealed high weed infestation in sorghum/cowpea farms then in millet/cowpea and sesame/cowpea farms. Out of the 26 weed species identified, broad leaved weeds were the most dominant (15 species) followed by grasses (8 species) and then sedges (3 species). Across crop types, D. aegyptium and E. tremula were persistently the most prominent with respect to frequency, density and dominance as recorded in 2008 weed assessment.***

Keywords: survey, weed flora, kazaure, agricultural zone

I. INTRODUCTION

Weeds are unwanted plants which succeed in the struggle for existence in competition with crops (Lavabre, 1991). Weeds compete with crops for the limited environmental resources and more often than not such competition becomes manifested in poor crop growth with subsequent reduction in crop yield (Karaye, *et al*; 2007). The greatest loss in crop yield due to weed competition occurs during the critical period of weed competition: the period of crop growth when it is most susceptible to weed competition (Akobundu, 1993).

The four crops (millet, sorghum, cowpea and sesame) are usually grown in mixture during wet season in the study area. However, hoe weeding appears to be the conventional practice of controlling weeds in the area. Successful weed control programme in any crop depends on good Knowledge of the weeds present in that ecology (Karaye, and Yakubu, 2006). Understanding weed crop interactions as well as the nature and functions of their interactions will help in understanding the impact of crop production and husbandry practice on the shift in weed flora, particularly the persistence of some weeds in a given weed-crop ecosystem (Lado *et,al*; 2008). Some

weeds and crops are site specific while others will thrive over a wide range of habitat. Many weed species closely associated with cultivated crops have requirements very similar to those of the crops (Yakubu, *et al*; 2006).

Weeds are subject to changes either in abundance or in the weed species presence in a locality over a period of time (Yakubu, *et al*; 2006). Weeds shift are known to occur in continuously cultivated land in response to tillage practice, cropping system, weed control strategies and other changes in the habitat (Smith and Akinde, 2000).

The four crops (millet, sorghum, cowpea and sesame) constitute the major crops produced in northern Nigeria as such predominate in the farming system. However, the yields of these crops are generally low as a result of erratic rainfall, low soil fertility, weed infestation and continued use of unimproved crop varieties. Of these, weed infestation is considered as a major limitation to the production of these important crops (Yusif, 2008). Consequently, peasant farmers devote much of their efforts and resources to manual weed control.

The presence of different crop species on a given piece of land often results in different weed species on such land owing to different host crop species. Thus, monitoring weeds shifts as a result of growing different crop species in space or time in a given location is important for mapping out weed control strategies.

It was therefore against this background that this research work was conducted with an aim to assess the weed flora in Kazaure agricultural zone of Jigawa State which will assist in mapping out control measures of the identified weed species.

II. MATERIALS AND METHODS

The survey was conducted during 2017 wet season at Kazaure agricultural zone of Jigawa State (Latitude 12^{o} 6^{1}N, longitude 8^{o} 4^{1}E and 412m above the sea level). A total of 15 farms each of sorghum/cowpea, millet/cowpea and sesame/cowpea mixture were randomly selected based on their status of intensive cultivation. The farms were located at Kazaure, Roni and Sule-Tankarkar towns, respectively. Weed species were collected over a period of three months from July to September in 2017 cropping season. Wooden quadrate of $1m^2$, masking tape, marker, paper, polythene bags and pencils were the materials used throughout the survey.

Weeds within the $1m^2$ quadrate were hand pulled from the soil with their roots intact. All the weed samples were individually tagged, counted, identified and separated by species.

Ecological analysis of the weed flora was carried out to determine the relative frequency, relative density and summed dominance ratio according to Wirjahadja and Pancho (1975) using the equations below:

- ✓ Relative frequency = $\frac{\text{Frequency value of one weed species}}{\text{Frequency value of all weeds species}} \times 100$
- ✓ Relative density = $\frac{\text{Density value of one weed species}}{\text{Density value of all weeds species}} \times 100$
- ✓ Summed dominance ratio = $\frac{\text{Relative Frequency + Relative density}}{2}$

Only weeds that occurred at ≥5% relative frequency, relative density and summed dominance ratio were considered as being common.

III. RESULT

The common weed species recorded in the 15 sampled farms along with their individual level of infestation are presented in Table 1. It could be observed from the table that a total of twenty six (26) weed species were identified. Out of these, broad leaved weeds were the most dominant species (15 species) followed by grasses (8 species) and then sedges (3 species). Within the broad leaved group of weeds *Portulaca oleracea*, *Cyathula prostrata* and *Alysicarpus vaginalis* were the species with highest frequency. Among the family gramineae, *Erogrostis tremula*, *Dactyloctenium aegyptium*, *Chloris pilosa* and *Eleusine indica* were the most occurring species while *Cyperus esculentus* appeared to be the most frequent species among the sedges.

It can also be observed from the table that high level of weed infestation was recorded in sorghum/cowpea farms (26 species) followed in descending order by millet/cowpea farms (22 species) and then sesame/cowpea farms (20 species). There were four weed species (*Chloris pilosa*, *Ageratum conyzoides*, *Mitrocarpus hirtus* and *Cyperus rotundus*) that were found in sesame/cowpea fields but not found in sorghum/cowpea fields. While *Striga hermonthica* was absent in sesame/Cowpea farms but present in millet/cowpea farms. However, all the weed species identified during the survey were present in sorghum/cowpea farms.

Weed Species	Sorghum/Cowpea	Millet/Cowpea	Sesame/ Cowpea
Grasses	**Level of Infestation**		
Andropogon gayanus			
Cenchrus bifloris	X	X	-
Chloris pilosa	X	X	X
Dactyloctenium aegyptium	XX	-	XX
	XXX	XXX	XXX
Digitaria horizontalis	X	X	X
Erogrostis tremula	XXX	XXX	XXX
Eleusine indica	XX	XX	XX
Pennisetum pedicellatum	X	X	X
Broad leaved weeds	X	X	X
Amaranthus spinosus	X	-	X
Ageratum conyzoides	XXX	XXX	XX
Alysicarpus vaginalis	XXX	XX	XX
Cyathula prostrata	X	X	-
Cassia tora	X	XX	X
Crotalaria retusa	X	X	-
Euphorbia hirta	XX	X	X
Hibiscus asper	X	XX	-
Ipomea aquatica	X	-	X
Mitrocarpus hirtus	XXX	XX	-
Portulaca oleracea	X	X	X
Striga gesnoroides	X	X	-
Striga hermonthica	X	X	X
Stylochitum loncifolius	X	X	X
Tridex procumbers			
Sedges	XX	XX	X
Cyperus esculentus	X	-	X
Cyperus rotundus	X	X	X
Cyperus difformis			

Source: Fieldwork 2017 wet season.
Keys: = Nil (absent)

X = Low infestation (1-39% occurrence)
XX= Moderate infestation (40-59% Occurrence)
XXX= High infestation (60-100% occurrence).

Table 1: Weed species and their individual level of infestation in sorghum/cowpea, millet/cowpea and sesame/cowpea farms

IV. RELATIVE FREQUENCY

The relative frequency of weed species found in the three mixed cropping systems is presented in Table 2. It could be observed that out of the 26 weed species recorded in sorghum/cowpea farms, only five weed species (*D. aegyptium* (5.10%) *A. vaginalis* (5.50%), *C. prostrata* (5.51%) *P. oleracea* (5.51%) and *E. tremula* (5.80%) occurred at relative frequency of ≥5%. While 8 weed species with relative frequency of ≥5% were recorded in both millet/cowpea and sesame/cowpea farms with *E. tremula* being the highest with regard to occurrence (7.76%).

Weed Species	Sorghum/ Cowpea	Millet/ Cowpea	Sesame/ Cowpea
Grasses			
Andropogon gayanus	4.51	6.20	-
Cenchrus bifloris	3.87	4.65	4.85
Chloris pilosa	4.51	-	6.79
Dactyloctenium	5.16	6.97	5.82
aegyptium	3.71	3.46	3.56
Digitaria horizontalis	5.8o	5.42	7.76
Erogrostis tremula	4.51	5.42	6.79
Eleusine indica	3.22	4.65	3.88
Pennisetum pedicellatum			
Broad leaved weeds	3.87	-	3.88
Amaranthus spinosus	3.51	3.87	5.82
Ageratum conyzoides	5.50	6.97	6.79
Alysicarpus vaginalis	5.51	5.42	5.82
Cyathula prostrata	3.87	4.65	-
Cassia tora	3.51	4.65	4.85
Crotalaria retusa	3.22	3.10	-
Euphorbia hirta	3.22	3.87	5.82
Hibiscus asper	3.52	6.20	-
Ipomea aquatica	3.22	-	3.88
Mitrocarpus hirtus	5.51	5.42	-
Portulaca oleracea	3.87	3.87	3.88
Striga gesnoroides	3.22	3.10	-
Striga hermonthica	3.87	3.87	4.85
Stylochitum loncifolius	3.52	4.65	4.85
Tridex procumbers			
Sedges	3.87	3.87	4.85
Cyperus esculentus	2.58	-	3.88
Cyperus rotundus	3.22	3.81	4.85
Cyperus difformis			
	5	8	8
Number of common weeds			

Source: Fieldwork 2017 wet season.

Table 2: Relative frequency (%) of weed species in sorghum/cowpea, millet/cowpea and sesame/cowpea farms

V. RELATIVE DENSITY

Table 3 presents the relative density of weed species in three different mixed cropping systems. Results indicated that 7, 9, and 6 weed species each in sorghum/cowpea millet/cowpea and sesame/cowpea farms were observed to be the most dominant. In sorghum/cowpea farms, *D.aegyptium (*8.83%), *A. vaginalis* (8.65%) and *C.prostrata* (8.25%) were found to be the most dominant species. The same trend was also observed in millet/cowpea farms, with *A. vaginalis* (11.50%) and *D. aegyptium* (11.30%) excelling as the most dominant species. However, *E. tremula* (14.70%) was noted to be the highest with respect to relative density in sesame/cowpea farm.

Weed Species	Sorghum/ Cowpea	Millet/ Cowpea	Sesame/ Cowpea
Grasses			
Andropogon gayanus	2.62	2.67	-
Cenchrus bifloris	1.6	2.74	4.15
Chloris pilosa	4.5	-	9.27
Dactyloctenium aegyptium	8.83	11.30	7.43
Digitaria horizontalis	3.92	2.62	2.35
Erogrostis tremula	7.97	7.02	14.70
Eleusine indica	5.58	6.27	8.40
Pennisetum pedicellatum	1.72	2.83	3.25
Broad leaved weeds			
Amaranthus spinosus	2.19	-	3.53
Ageratum conyzoides	2.83	2.99	4.09
Alysicarpus vaginalis	8.65	11.50	7.83
Cyathula prostrata	8.55	6.91	6.78
Cassia tora	2.10	2.99	-
Crotalaria retusa	5.09	6.09	3.50
Euphorbia hirta	1.91	2.54	-
Hibiscus asper	4.01	3.39	3.50
Ipomea aquatica	1.92	5.91	-
Mitrocarpus hirtus	4.18	-	2.29
Portulaca oleracea	6.48	5.62	-
Striga gesnoroides	2.43	3.05	3.61
Striga hermonthica	2.32	1.86	-
Stylochitum loncifolius	2.65	2.83	3.08
Tridex procumbers	4.48	3.41	3.59
Sedges			
Cyperus esculentus	3.87	5.71	3.75
Cyperus rotundus	1.56	-	3.42
Cyperus difformis	1.98	2.26	3.73
Number of Common weeds	7	9	6

Source: Fieldwork 2017 wet season.

Table 3: Relative density ((%) of weed species in sorghum/cowpea, millet/cowpea and sesame/cowpea farms

VI. SUMMED DOMINANCE RATIO

Table 4 shows the summed dominance ratio of the various weed species observed in the three mixed cropping systems. The results revealed that in sorghum/cowpea farms, 13 weed species occurred at summed dominance ratio of ≥ 5% with *D. aegyptium* being the highest (11.41%) and *A. Conyzoides* was the lowest (5.08%) in dominance. The number of dominant weeds slightly increased in millet/cowpea farms with *D. aegyptuim* persisting as the most dominant (14.78%) while C. *bifloris* was the least dominant (5.08%). However, in sesame/cowpea farm, all the 20 weed species identified with the exception of *D. horizontalis* and *M. hirtus* occurred at summed dominance ratio of ≥ 5% with *E. tremula* being the highest (18.58%) and *P. pedicellatum* appeared to be the lowest (5. 19%). Across the three mixed cropping systems, *E. tremula* was observed to be the highest with regard to summed dominance ratio (18.58%).

Weed Species	Sorghum/ Cowpea	Millet/ Cowpea	Sesame/ Cowpea
Grasses			
Andropogon gayanus	4.87	5.77	-
Cenchrus bifloris	3.53	5.06	6.57
Chloris pilosa	6.90	-	12.66
Dactyloctenium aegyptium	11.41	14.78	10.34
Digitaria horizontalis	4.81	4.52	4.21
Erogrostis tremula	10.87	9.73	18.58
Eleusine indica	7.83	8.98	11.79
Pennisetum pedicellatum	3.33	5.15	5.19
Broad leaved weeds			
Amaranthus spinosus	4.12	-	5.47
Ageratum conyzoides	5.08	4.92	7.0
Alysicarpus vaginalis	10.90	14.98	11.22
Cyathula prostrata	10.50	9.62	9.69
Cassia tora	4.03	5.31	-
Crotalaria retusa	7.34	8.41	5.92
Euphorbia hirta	3.52	4.09	-
Hibiscus asper	5.62	5.32	6.41
Ipomea aquatica	3.53	9.01	-
Mitrocarpus hirtus	6.43	-	4.21
Portulaca oleracea	8.48	8.33	-
Striga gesnoroides	4.36	4.98	5.55
Striga hermonthica	3.93	3.41	-
Stylochitum loncifolius	4.58	4.76	5.50
Tridex procumbers	6.73	5.73	6.01
Sedges			
Cyperus esculentus	5.80	7.64	6.17
Cyperus rotundus	2.85	-	5.36
Cyperus difformis	3.59	3.81	6.15
Number of Common weeds	13	15	18

Source: Fieldwork 2017 wet season.

Table 4: Summed dominance ratio of weed species in sorghum/cowpea, millet/cowpea and sesame/cowpea farms

VII. DISCUSSION

The results of the survey indicated that the zone was infested by various categories of weed species which include broad leaved weeds, grasses and sedges. A total of twenty six (26) weed species were identified out of which broad leaved weeds were the most dominant (15 species) followed in descending order by grasses (8 species) and then sedges (3 species) Table 1. The distribution of these weeds across the zone and crop types, might have been influenced by the prevailing cropping systems, tillage practices, weed management strategies and their adoptability to different soil and climatic conditions (Nazeer *et al*;(2005) and yusif (2008) reported similar trend

The persistence of broad leaved weeds as the most dominant across the zone and crop types might be associated with their rapid ephemeral growth rate, high seed production and efficient means of seed dispersal. This buttressed the findings of karaye and Yakubu, (2006) and Alhassan *et al*, (2007). It could also be possible that these weeds (broad leaved) have requirements some what similar to those of the grown crops. The assertion might be true; hence, Yakubu *et al*, (2006) reported that many weeds that are closely associated with cultivated crops have requirements very similar to those of the crops.

The higher number of weed species recorded in sorghum/cowpea farms could be attributed to host specific nature of some weed species. This observation agreed with that of Yakubu *et al;* (2006) who reported that some weeds and crops are host and site specific while others can thrive over a wide range of habitat.

The inherent ability of sesame and cowpea plants to develop adequate leaf area index within a shortest possible time that prevents sunlight from reaching the competing weeds at the surface through shading, could be responsible for the lower number of weed species observed in sesame/cowpea farms. In the same vein, OCIA (2002) reported that the competitiveness of a crop plant is enhanced by rapid growth rate, early canopy development and profuse branching. The prevalence of *D.aegyptium* and *E.tremula* as the most prominent with respect to frequency, density and dominance across crop types, could be ascribed to their high growth rate, fecundity and effective seed dispersal mechanism.

High infestation of these weeds in the four crops (sorghum, millet, sesame and cowpea) can cause a considerable loss in yield due to competition. This calls for an integrated weed management approach rather than the conventional hoe weeding, if the returns on investment are to be increased.

VIII. CONCLUTION

The survey revealed that high weed infestation was recorded in sorghum/cowpea farms than in millet/cowpea and sesame/cowpea farms. Results also indicated that out of the 26 weed species identified, broad leaved weeds were the most dominant (15 species) followed by grasses (8 species) and sedges (3 species). Across crop types, *D. aegyptium and E. tremula* were observed to be the most prominent with respect to frequency, density and dominance, respectively. Yield losses commonly experienced by farmers in the study area may partly be as a result of the different weed infestation in the zone and partly due to poor crop management practices.

IX. RECOMMENDATIONS

Based on the results of this study, the following recommendations were made:

- ✓ In addition to the conventional hoe weeding, integrated weed management approach should be adopted by farmers to ensure effective weed management.
- ✓ Further research needs to be carried out to ascertain the density at which these weeds can cause economic damage to crops.
- ✓ A more detail study on weed-crop ecological interactions and the nature and functions of these interactions needs to be carried out to fully understand their biology for better weed control.

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