# DISTRIBUTION OF WEED SPECIES IN RICE (*Oryzasativa*L.) AND MAIZE (*Zea mays* L.) FIELDS ATBAUCHI, NORTH EASTERN NIGERIA.

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**ABSTRACT:** *A study was carried out to determine the distribution of weed species in rice and maize fields in Bauchi and its environs from June to August 2000. Seventy sites in 7 different localities namely, Birshi Fulani, BirshiGandu, Lushi, Miri, Wunti-Dada, Inkil and Gubi were selected. Quadrats 0.25m x 0.25m were used in the collection of data in these fields. The monocotyledonous weeds Kyllingatenuifolia, Commelinabenghalensis and Digitariahorizontalis were the dominant weed species in rice fields in descending order, significantly different, at $P \leq 0.05$, from all the other weed species in rice fields. In maize fields. Acanthospermumhispidum a dicotyledonous plant was outstandingly dominant, significantly different, at $P \leq 0.05$, from all other weed species in maize fields. A. hispidum was closely followed by Cassia obtusifolia, Chlorispilosa and Oldenlandiacorymbosa which were not significantly different from each other at $P \leq 0.05$.The three most dominant weeds in rice fields only occurred eleventh, sixth and nineth respectively in maize fields with C. benghalensis significantly different, at $P \leq 0.05$, from K. tenuifolia and D. horizontalis. However, the overall dominant weed species recorded in all fields were Commelinabenghalensis which was significantly different from all the other weeds at $P \leq 0.05$.It was followed in dominance by Oldenlandiacorymbosa, Kyllingatenuifolia and Digitariahorizontal is which were not significantly different from each other ($P \leq 0.05$), but significantly different formChlorispilosa, Cynodondactylon, Portulacaoleracea, Cassia obtusifolia and Dactyloctenumaegyptium ($P \leq 0.05$).Inkil had the highest frequency of occurrence (%) of weed species in all fields though not significantly different from Birshi Fulani and Lushi. Most of the dominant weed species were monocotyledonous plants.*

**Key words:** *Weeds, Rice, Maize, Bauchi, Nigeria.*

## INTRODUCTION

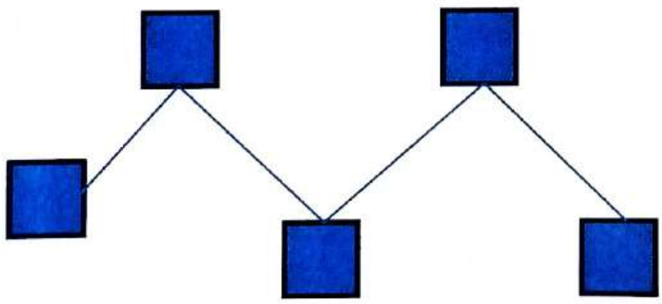
In Bauchi, the production of rice (*Oryzasativa* L.) and maize (*Zea mays* L.) which occupy a substantial proportion of farmland cultivated on annual basis is hindered by many factors; with weed infestation being one of the most important. This has reached the point of being the single most important factor limiting yields (Technical Centre for Agriculture and Rural Cooperation (CTA), 1988; Pal and Singh, 1990). Weeds being an integral components of the agro-system compete directly with crops (Terry, 1996) for limited supplies of soil water, soil nutrients, sunlight and other resources (Sharma, 1990). They also provide reservoirs for crop pests and pathogens (Terry, 1996). In sub-Saharan Africa, weeds are also a major obstacle in the production of crops (Marnotte, 1995; Gallandt and Weiner, 2007), like rice (De Datta, 1981) and maize (Maina, 1997).Despite the annual investment of financial resources and labour in weed management, weeds have still remained a serious constraint to the productivity of farming systems (Terry, 1996) including arable crops (Kato *et al.*, 2001). This could be attributed to the continuous use of individual control measures (Schneegurt *et al.*, 1994) which inturn permit a build up of the species that are not being controlled (FAO, 1986). Biological characters of crops as well as management tactics in the field have been shown to greatly influence the composition of weed communities (Thill and Mallory-Smith, 1997; Zimdahi, 2013). Their differential competition (Bergelson, 1996) results in the shift in the prominence of a species (Dieleman*et al.*, 2000; Opender and Cyperus, 2007) and as such renders their control difficult (Froud-Williams, 2001; Opender and Cyperus, 2007). This implies the need to have a good knowledge of the distribution of the weed species (FAO, 1986; Nandula, 2010) and the weed population dynamics (Froud-Williams, 2001) as they allow the prediction of weed relationship to the environmental conditions and enables their spread into new areas to be predicted and monitored as a means to an effective weed management strategy (FAO, 1986; Froud-Williams, 2001).

## MATERIALS AND METHODS

This study was carried out on cultivated rice and maize fields in seven localities in Bauchi, Nigeria and its environs. The seven localities selected were Birshi Fulani and BirshiGandu which are located South West of Bauchi town, Lushi (South), Miri and Wunti-Dada (West), Inkil (East) and Gubi areas (North).Bauchi falls within the north-eastern region of Nigeria, situated at latitude 10°22' north of the equator and longitude 9°47' east, at an altitude of 609.45m above sea level (Bukar*etal.*, 1997). It also falls within the semi-arid sub zoning farming system of the area with tropical sandy loam soils and a monsoonal climate characterized by well-defined rainy and dry seasons with rainfall of 500-1000mm annually (Bukar*et al.*, 1997).

**Experimental Design**

Fields (half a hectare), were selected at random in the various localities and surveyed according to the method of Thomas and Ivany (1990). Five quadrats each 0.25m² located equidistantly (one meter apart) along each of the four arms of an 'inverted W-pattern' was employed. The pattern is as shown below.



'Inverted W-pattern' showing the position of the five quadrats.

A total of ten routinely weeded farms were selected at random in each locality. These included five of sole rice crops and five of sole maize crops. The pattern of five quadrats was randomized in each field before moving to another field. The weed species were observed and noted within the limits of the quadrats.

**Frequency of Occurrence (%) of the Weeds**

The frequency of occurrence of weed species that occurred in rice fields was calculated as follows:

The total number of rice fields infested by each weed per location was noted and expressed as a percentage of the total number of rice fields surveyed in a location (5). This same procedure was followed to calculate the frequency of occurrence of weed species in maize fields.

The frequency of occurrence of weed species in rice and maize fields combined was calculated as follows:

The total number of fields infested by each weed species per location was noted and expressed as a percentage of the total number of fields surveyed in a location (10).

**Statistical Analysis of Data**

Data collected on the frequency of occurrence of the weeds in fields per location were subjected to analysis of variance to test the treatment effects for significance using the F-test as described Snedecor and Corchran (1989). The Duncan's Multiple Range Test at 5% Significance Level was used to rank the weed species by their mean values while significant differences among the means of the locations were separated using the Least Significant Difference at Probability Level of 5%.

## RESULTS AND DISCUSSION

### Frequency of Occurrence of Weed Species in Rice Fields

The frequency of occurrence of weed species found in rice fields around Bauchi is presented in Table 1. The Family *Cyperaceae* being represented by up to four species (*Kyllingatenuifolia, Mariscusalternifolius, Mariscusflabelliformis* and *Cyperusesculentus)*, is likely to emerge as a serious threat to the cultivation of rice in Bauchi and its environs. It has been observed that this family ranked third among the world's worst weeds, and has been generally difficult to control (Radosevich and Holt, 1984; Terry, 2001).

**Table 1: Frequency of Occurrence (%) of Weed Species found in Rice Fields around Bauchi.**

| Species | Mean* |
|---|---|
| *Kyllingatenuifolia* | 91.43 a |
| *Commelinabenghalensis* | 85.71 a |
| *Digitariahorizontalis* | 85.71 a |
| *Portulacaoleracea* | 71.49 b |
| *Oldenlandiacorymbosa* | 62.86 c |
| *Mariscusalternifolius* | 60.00 cd |
| *Cynodondactylon* | 57.14 cd |
| *Dactyloctenumaegyptium* | 54.29 de |
| *Ageratum conyzoides* | 48.57 e |
| *Chlorispilosa* | 48.57 e |
| *Mariscusflabelliformis* | 48.57 e |
| *Chrysanthellumamericanum* | 34.29 f |
| *Indigoferahirsuta* | 34.29 f |
| *Spermacocepusilla* | 31.43 fg |
| *Cassia obtusifolia* | 28.57 fgh |
| *Cyperusesculentus* | 28.57 fgh |
| *Tridaxprocumbens* | 28.57 fgh |
| *Brachiariadeflexa* | 25.71 ghi |
| *Schwenckiaamericana* | 25.71 ghi |
| *Bidenspilosa* | 22.86 hij |
| *Mitracarpusscaber* | 22.86 hij |
| *Aneilemalanceolatum* | 20.00 ijk |

| | |
|---|---|
| *Euphorbia heterophylla* | 17.14 jk |
| *Eragrostistenella* | 14.29 k |
| *Amaranthusspinosus* | 2.86 l |
| *Euphorbia hirta* | 2.86 l |

***Means followed by the same letters are not significantly different from each other at P ≤ 0.05**

*Cyperusesculentus* for example has a characteristic persistence and resistance to control and eradication. The *Cyperaceae* combine a well-developed tuber-system with moderate production of viable seeds (Akobundu, 1987).

Another weed, *Amaranthusspinosus,* has the capacity to produce up to 235,000 seeds per plant (Holm *et al.,* 1977). Although it had the lowest frequency of occurrence in this study, its significance should not be ignored because if its seeds are properly dispersed and they find themselves in favourable conditions then they could easily colonize most of the rice fields.

**Frequency of Occurrence of Weed Species in Maize Fields**

*Acanthospermumhispidum* is propagated by viable seeds, and is primarily dispersed by animals (Akobundu, 1987). Its high frequency of occurrence (100.00%; Table 2) suggests that if stray

**Table 2: Frequency of Occurrence (%) of Weed Species found in Maize Fields around Bauchi.**

| Species | Mean* |
|---|---|
| *Acanthospermumhispidum* | 100.00a |
| *Cassia obtusifolia* | 91.43 b |
| *Chlorispilosa* | 91.43 b |
| *Oldenlandiacorymbosa* | 91.43 b |
| *Leucasmartinicensis* | 85.71 c |
| *Commelinabenghalensis* | 77.14 d |
| *Cynodondactylon* | 74.29 d |
| *Boerhaviacoccinea* | 62.86 e |
| *Digitariahorizontalis* | 62.86 e |
| *Dactyloctenumaegyptium* | 60.00ef |
| *Kyllingatenuifolia* | 60.00ef |
| *Schwenckiaamericana* | 57.14fg |
| *Aspiliaafricana* | 54.29gh |
| *Setaria pallid-fusca* | 54.29 gh |
| *Portulacaoleracea* | 51.43 h |
| *Tridaxprocumbens* | 40.00 i |
| *Ageratum conyzoides* | 34.29 j |
| *Acalyphaciliata* | 31.43 j |
| *Bidenspilosa* | 25.71 k |
| *Mariscusalternifolius* | 25.71 k |
| *Eragrostistenella* | 22.86 kl |
| *Mitracarpusscaber* | 20.00 l |
| *Amaranthushybridus* | 17.14lm |
| *Brachiariadeflexa* | 14.29mn |
| *Strigahermontheca* | 14.29 mn |

| | |
|---|---|
| Cleome viscosa | 11.43 no |
| Amaranthusspinosus | 8.57 o |
| Boerhaviadiffusa | 8.57 o |
| Euphorbia heterophylla | 8.57 o |
| Euphorbia hirta | 8.57 o |

***Means followed by the same letters are not significantly different from each other at P ≤ 0.05**

animals are allowed to get in contact with maize fields often, *A. hispidum* could become a threat to maize production. Having semi-woody stands, they can lock up soil nutrients in their biomass which are not easily released back to the soil in time. Members of *Cyperaceae* have been reported as a serious threat to crop production (Doll, 1983) and are reported amongst the world's worst weeds owing to their developed tuber system which renders them difficult to control (Terry, 2001). Occurrence of species such as *Kyllingatenuifolia*and *Mariscusalternifolius*should therefore not be neglected.The parasitic weed,*Strigahermonthecagains* most of its nutrients directly from the host plant and is reported to produce about 42,000 seeds per plant. Parasitic weeds have been reported to damage crop hosts much more severely than non-parasitic weeds do in sub-Saharan Africa (Sauerborn, 1991; Parker and Riches, 1993). Although *S. hermonthecahas* a low frequency of occurrence in this study, this could go higher and consequently reduce the yield of maize in Bauchi.

**Frequency of Occurrence (%) in Rice and Maize Fields Combined.**

*Commelinabenghalensis, Oldenlandiacorymbosa, Kyllingatenuifolia, Digitariahorizontalis, Chlorispilosa, Cynodondactylon, Portulacaoleracea, Cassiaob tusifolia and Dactyloctenumaegyptium*were the dominant weed species (Table 3)

**Table 3: Frequency of Occurrence (%) of Weed Species in Rice and Maize Fields Combined around Bauchi.**

| Species | Mean* |
|---|---|
| *Commelinebenghalensis* | 81.43 a |
| *Oldenlandiacorymbosa* | 77.14 b |
| *Kyllingatenuifolia* | 75.71 b |
| *Digitariahorizontalis* | 74.29 b |
| *Chlorispilosa* | 70.00 c |
| *Cynodondactylon* | 65.71 d |
| *Portulacaoleracea* | 61.43 e |
| *Cassia obtusifolia* | 60.00ef |
| *Dactyloctenumaegyptium* | 57.14 f |
| *Acanthospermumhispidum* | 50.00 g |
| *Leucasmartinicensis* | 42.86 h |
| *Mariscusalternifolius* | 42.86 h |
| *Ageratum conyzoides* | 41.43 h |
| *Schwenckiaamericana* | 41.43 h |

| | |
|---|---|
| *Tridaxprocumbens* | 34.29 i |
| *Boerhaviacoccinea* | 31.43 i |
| *Aspiliaafricana* | 27.14 j |
| *Setaria pallid-fusca* | 27.14 j |
| *Bidenspilosa* | 24.29jk |
| *Mariscusflabelliformis* | 24.29jk |
| *Mitracarpusscaber* | 21.43kl |
| *Brachiariadeflexa* | 20.00lm |
| *Eragrostistenella* | 18.57lmn |
| *Chrysanthellumamericanum* | 17.14mno |
| *Indigoferahirsuta* | 17.14mno |
| *Acalyphaciliata* | 15.71nop |
| *Spermacosepusilla* | 15.71nop |
| *Cyperusesculentus* | 14.29op |
| *Euphorbia heterophylla* | 12.86p |
| *Amaranthushybridus* | 8.57q |
| *Aneilemalanceolatum* | 8.57q |
| *Strigahermontheca* | 7.14qr |
| *Amaranthusspinosus* | 5.71qr |
| *Cleome viscosa* | 5.71qr |
| *Euphorbia hirta* | 5.71qr |
| *Boerhaviadiffusa* | 4.29r |

***Means followed by the same letters are not significantly different from each other at P $\leq 0.05$**

and occurred in both rice and maize fields.*Commelina*sp. *and* *Digitaria*sp. which were recorded as the most common weeds in Bauchi area by Okafor and Adegbite (1991) were also found to be the dominant species in this study. The increase in dominant species in this area could be attributed to the rapid changes towards intensive land use and cropping patterns. More intensive land use attracts more weeds (Sen, 1981; Radosevich and Holt, 1984). Dominance of weed species however, may not directly imply their extent of negative impact on crop yields (Schonbeck, 2013) because host specific species such as *Strigahermontheca*have proven to be major limitations to yield of crops including sorghum, pearl millet and maize in Africa (Gworgwor and Weber, 1991) although it may occur in lower frequencies when compared with other species.

**Frequency of Occurrence (%) by Location**

The high frequency of occurrence in Inkil, (Tables 4, 5 and 6), suggests that the land use intensity in Inkil is higher than in other locations.

**Table 4: Frequency of Occurrence (%) of Weed Species in Rice Fields by Location aroundBauchi.**

| Location | Mean* |
|---|---|
| Inkil | 47.69 a |
| Birshi Fulani | 44.62ab |
| Lushi | 43.85 ab |
| Miri | 42.31 ab |
| Gubi | 40.00 bc |
| BirshiGandu | 34.62 cd |
| Wunti Dada | 30.77 d |
| LSD(0.05) | 5.82 |

***Means followed by the same letters are not significantly different from each other at $P \leq 0.05$**

Sen (1981) and Radosevich and Holt (1984) observed that more intensive land use attracted more

**Table 5: Frequency of Occurrence (%) of Weed Species in Maize Fields by Location around Bauchi.**

| Location | Mean* |
|---|---|
| Inkil | 52.00 a |
| Birshi Fulani | 51.33 ab |
| Lushi | 50.67 abc |
| Gubi | 46.67 bc |
| Miri | 46.00 c |
| BirshiGandu | 37.33 d |
| Wunti Dada | 34.67 d |
| LSD(0.05) | 5.18 |

***Means followed by the same letters are not significantly different from each other at $P \leq 0.05$**

weeds and that most crops have weedy forms, some of which are found only in association with man (cultivated habitats).

**Table 6: Frequency of Occurrence (%) of Weed Species in Rice and Maize Fields Combined, by Location around Bauchi.**

| Location | Mean* |
|---|---|
| Inkil | 38.61 a |
| Birshi Fulani | 37.50ab |
| Lushi | 36.94abc |
| Miri | 34.44 bc |
| Gubi | 33.89 c |

| | |
|---|---|
| BirshiGandu | 28.06 d |
| Wunti Dada | 25.56 d |
| LSD(0.05) | 3.07 |

***Means followed by the same letters are not significantly different from each other at P ≤ 0.05**

## CONCLUSION

The study revealed that most of the dominant weed species were monocotyledonous plants. However, further works of this nature need to be carried out to be able to study the weed distribution/population dynamics over a period of time. This will go a long way in the establishment of a good weed control programme for the area under study.

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