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WEED-CROP ASSOCIATION: A CASE STUDY OF FARMLANDS LOCATED AT THE COLLEGE OF EDUCATION, WARRI, DELTA STATE

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ABSTRACT

The impact of weeds on crops has remained an enigma to achieving sustainable food security. The study was conducted in the College of Education, Warri South Local Government Area of Delta State, to assess the prevalence and occurrence of weed species as a prerequisite to identifying sustainable control measures. A field survey was carried out using a 29cm x 29cm size quadrant with seven samples from each field. Several weed species were identified, and the data was used to calculate each species' average frequency, density, and percentage frequency. Twenty-two (22) weed species distributed among 20 genera and 15 families were identified from the different farmlands. The results showed that the most dominant species were *Ageratum conyzoide*s, with an average frequency of 104.14, an average density of 0.124 and relative frequency of 31.95%; *Oldenlandia corymbosa* with an average frequency of 72.57, average density of 0.086 and relative frequency of 21.65% and *Veronica serpyllifolia* with an average frequency of 40.43, average density of 0.049 and relative frequency of 12.41. The least dominant species was *Sida acuta,* with an average frequency of 0.14, an average density of 0.000, and a relative frequency of 0.04, followed by *Alternanthera philoxeroides*, with an average frequency of 0.43, an average density of 0.001 and percentage frequency of 0.13. Poaceae, with four species, had the highest abundance of species. The results obtained from this study would help develop a weed control program and make informed decisions regarding herbicide selection.

Keywords: Weed, Survey, Farmlands, Frequency, Dominant species.

INTRODUCTION

Weeds are unwanted plants that compete with crops for insufficient sources consisting

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of water, nutrients, and light energy needed for the growth of crops. However, a plant can be considered as a weed depending on each particular situation where they occur and the plants involved. Weed competition reduces yield and consequently farm income (Hassannejad & Ghafarbi, 2012). Weeds infestation also encourage disease problems, serve as alternate host for deleterious insects and diseases, slow down harvesting, restricts operations, increase the price of production, lessen the commercial price of produce, and increase the threat of fire out-break in perennial vegetation. ((Palumbo, 2013; Tena *et al.*, 2012). Currently, weeds play a tremendous function in making pest issues very complex, one of the biggest hurdles for farmers is effective weed control (Vissoh *et al.*, 2004). Thus, it is fundamental to characterize suitable weed management techniques that ensure satisfactory productivity. To ensure appropriate forms of weed control, it is necessary to study their communities and the primary step is through floristic inventories which are often done to know the composition and estimation of the abundance of species in a community as well as those of significant importance (Booth *et al*., 2003). Furthermore, floristic inventories permit comparing the degree of heterogeneity between two or more communities of diverse territories, or same environment over time (Campo *et al.*, 2014, Quintero-Pertúz *et al*., 2020). According to Storkey and Neve, 2018 the diversity of weeds has been proposed as an indicator of overall crop sustainability. Although most farmers are less concerned about the negative impact that weeds contribute to their crops, in a study conducted by Upadhyay *et al.*, up to 45% of the total annual losses of agricultural products losses (Upadhyay *et al.*, 2011). Yield losses due to weed competition in Africa vary from 55 to 90% for maize, 50% for beans, 40 to 80% for

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sorghum, 40 to 60% for cowpea, 50 to 80% for wheat and peanuts, and 90% for cassava. (Dadari, and 2005; Hamza;Ishaya *et al* 2007b; Chikoye *et al*., 2004 in Sintayehu 2019). It has been revealed that the flora of agroecosystems undergoes modification in diversity, composition and abundance as a reaction to climatic variations, the crop cycle, edaphic factors and primarily to agricultural management practices (Nichols *et al.*, 2015). These modifications can be expressed via the arrival of recent species inside the community, the disappearance of a few preexisting species or the evolution of biotypes with an extra aggressive potential in reaction to the pressures exerted via way of means of the given agricultural practices, (Pollnac *et al.*, 2008; Ghersa and Ferraro, 2012). Therefore, it is crucial to evaluate the weed composition found in farmlands at the College of Education. Such assessment offers insights into both current and future conditions of the weed community. The data gathered from weed assessment offers quantitative insights to weed biologists and ecologists, aiding in the formulation of integrated weed management plans and recommendations for weed control. Hence to develop a proper weed management control, a floristic inventory of the weed species associated with cropland is necessary. However, no information on weed database exist in College of Education Warri, hence, the aim of this study was to identify, classify and document the distribution and intensity of weed flora prevailing in farmlands in College of Education, Warri.

MATERIALS AND METHODS

Study Area

The study area is within the farms opposite the ATM gallery at College of Education in Warri South Local Government Area of Delta State. It lies between Latitude 5°

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32’33” N and Longitude 5°44’32” E, with an altitude of 29.16m.

Sampling strategy

Descriptive survey was used as the research design for this study. A simple random throw technique was used to collect different weeds species from the 17 farm lands. A quadrat measuring 0.3m x 0.3m was randomly placed in weed- infested areas of each of the farmlands. Measuring tape was used in determining the size of the farm land (length and width of the farmland). The GPS was used to determine the site /or farm location. An online GPS APP VERSION 5.02(238) https://mygpscoordinates.page.link /share-a Note Book and Pen, these were used to take records of the number of weeds species on each farmland visited. The throw was made seven times randomly and weed were collected for identification.

Data collection and Plant identification

The number of weed species in each farm land was counted and recorded for subsequent data entry and analysis. Surveyed plants were identified and verified on site with help of a plant taxonomy specialist from known to the unknown using available resources as well making reference to the Flora of West Tropical Africa by Hutchinson and Dalziel (1963). Species that was not identified in the field was tagged and transported for later identification (Chancellor and Froud-Williams, 1982; 1984; Hakim *et al.,* 2013). The data were summarized using descriptive and quantitative analyses as follows:

$$\text{Average Frequency} = \frac{\text{Total number of individual Species occurring in each farm}}{\text{Total Number of throws}}$$

$$\text{Density} = \frac{\text{Average Frequency}}{\text{Area of quadrants}} \; x \; \frac{100}{1}$$

$$\text{Relative Frequency} = \frac{\text{Frequency of species}}{\text{Total frequency of species}} \; x \; \frac{100}{1}$$

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RESULTS AND DISCUSSION

Table 1: Weed Species of farmlands in College of Education Warri

Scientific Name	Family Name	Common Name	LC	GH
Ageratum conyzoides L.	Asteraceae	Billygoat weed	A	H
Oldelandra corymbosa L.	Rubiaceae	Diamond flower	A	H
Veronica serpyllifolia L	Plantaginaceae	Thyme-leaf speedwell	P	H
Polygonum aviculare L	Polygonaceae	Knot grass	A	H
Cleome rutidosperma DC (*Cleome ciliata*Schumach*)*	Cleomaceae	Wild mustard	A	H
Cyperus esculentus L.	Cyperaceae	Yellow nut sedge	P	S
Commelina benghalensis L.	Commelinaceae	Benghal dayflower	P	H
Alternanthera sessillis (L.) R. Br. ex DC	Amaranthaceae	Parrot leaf	A	H
Commelina erecta L.	Commelinaceae	Blue commelina	P	H
Kyllinga bulbosa Beauv.	Cyperaceae	Spike sedge	P	S
Gaunsoga quadriraduata Cav.	Asteraceae	Shaggy soldier	A	H
Portulaca oleracea L.	Portulacaceae	Pigweed	A	H
Solenostemon monostachyus(P.Beau.)	Lamiaceae	Catnip	A	H
Eragrostis tenella (L.) Roem.&Schult.)	Poaceae	Feathery lovegrass	A	G
Pennisetum purpureum Schumach	Poaceae	Elephant grass	P	G
Heterotis rotundifolia (Sm Jacq.-Fel	Melastomataceae	Pinklady	P	H
Peperomia pellucida (L.) Kunth	Piperaceae	Shiny bush	P	H
Asystasia gigantica (L) T.Anderson	Acanthaceae	Creeping foxglove	P	H
Poa annua L.	Poaceae	Annual bluegrass	A	G
Paspalum notatum Fluegge	Poaceae	Bahia grass	P	G
Alternatheria philoxeriodes (mart.) Griseb.	Amaranthaceae	Aligator weed	P	H
Sida acuta Burm. F	Malvaceae	Teaweed	P	H

Key: LC=life cycle, GH=growth habit, perennial and A= annual, G=grass, H=herb, S=sedge

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Table2: Weed species showing Frequency, Density and Percentage frequency

Family	Name of Species	Throws							Total	Average Freq.	Density	Relative Frequency (%)
		1	2	3	4	5	6	7				
Asteraceae	*Ageratum conyzoides* L.	129	81	85	99	133	118	84	729	104.14	0.124	31.95
Rubiaceae	*Oldelandra corymbose* L.	189	61	25	51	27	77	64	494	70.57	0.084	21.65
Plantaginaceae	*Veronica serpyllifolia* L.	20	57	35	20	35	76	40	283	40.43	0.048	12.41
Polygonaceae	*Polygonum aviculare* L.	40	5	0	0	0	0	100	145	20.71	0.025	6.36
Cleomaceae	*Cleome rutidosperma* DC.	7	9	4	14	7	4	52	97	13.86	0.016	4.25
Cyperaceae	*Cyperus esculentus* L.	2	15	3	4	4	42	13	83	11.86	0.014	3.64
Commelinaceae	*Commelina benghalensis* L.	5	13	11	24	18	6	4	81	11.57	0.014	3.55
Amaranthaceae	*Alternanthera sessillis* (L.) R. Br. ex DC		3	1			60	2	66	9.43	0.011	2.89
Commelinaceae	*Commelina erecta* L.	5	7	3	1	13	16	16	61	8.71	0.010	2.67
Cyperaceae	*Kyllinga bulbosa* Beauv	4	2	3	5	10	34	2	50	7.14	0.008	2.19
Asteraceae	*Gaunsoga quadriraduata* Ruiz &Pav.	0	0	23	10	8	8	0	49	7	0.008	2.14
Portulacaceae	*Portulaca oleracea* L.	0	0	0	0	3	4	30	37	5.29	0.006	1.62
Lamiaceae	*Solenostemon monostachyus* (P.Beau.	1	1	2	2	4	7	4	21	3	0.004	0.92
Poaceae	*Eragrostis tenella* (L.) Roem.&Schult.)							20	20	2.86	0.003	0.88
Poaceae	*Pennisetum purpureum*	4	3	3	2	1	2	2	17	2.43	0.003	0.75

	Schumach											
Melastomataceae	*Heterotis rotundifolia* (Sm Jacq.-Fel		8			5			12	1.71	0.002	0.36
Piperaceae	*Peperoma pellucida* (L.) Kunth	3			8				11	1.57	0.002	0.48
Acanthaceae	*Asystasia gigantica* (L) T.Anderson	1	3	5					9	1.29	0.002	0.39
Poaceae	*Poa annua* L.		3		2			2	7	1	0.001	0.31
Poaceae	*Paspalum notatum* Flugge'						3	2	5	0.71	0.001	0.22
Amaranthaceae	*Alternatheria philoxeriodes* (mart.) Griseb.	0	0	0	0	0	1	2	3	0.43	0.001	0.13
Malvaceae	*Sida acutu* Burm. F						1		1	0.14	0.000	0.04

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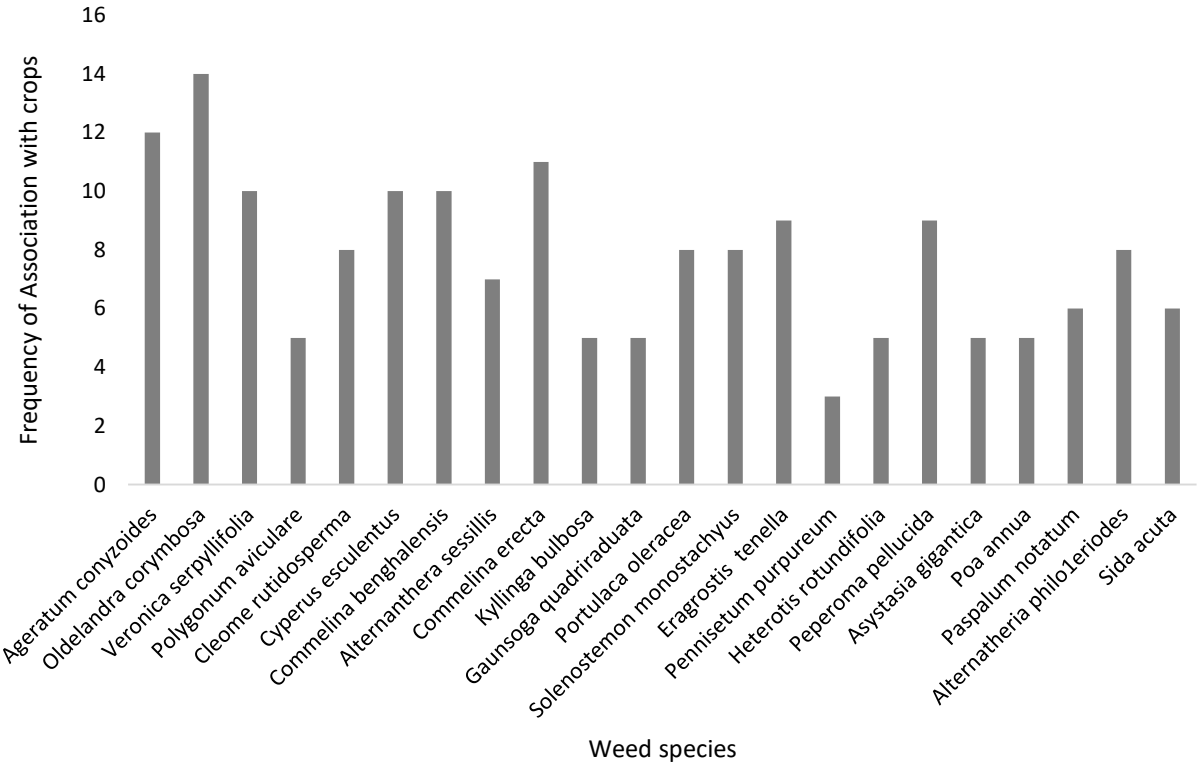

Figure 1: Prevalence of weed species association with crops in study site.

DISCUSSION

The data collected from the 17 farmland showed that a total of 22 species of weed belonging to 20 genera and 15 families were identified. The crops cultivated in the study area associated with these weeds are vegetables, cassava, plantain, cocoyam, and pepper. The dominant weed species found in the total farmland were *Ageratum conyzoides*, with an average frequency of 104.14, and *Oldenlandra corymbosa* with an average frequency of 72.57, closely followed by *Veronica serpyllifolia* with an average frequency of 40.43, *Polygonum aviculare* with an average frequency of

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20.71, *Commelina benghalensis* with an average frequency of 11.57, *Cyperus esculentus* occurred with an average frequency of 11.86 *Commelina erecta* with an average frequency of 8.71, and *Cleome rutidosperma* with an average frequency of 13.86. The least dominant species was *Sida acuta*, with an average frequency of 0.14. (Table 2).

In Figure 1 above, the prevalent weed species association that is dominant with the cultivated crops in the study site is as follows: *Oldenlandra corymbosa* having been associated with the total 14 crops, follow by *Ageratum conyzoides* with 12 crops, *Commelina erecta* with 11 crops, *Veronica serpyllifoliaCyperus esculentus* and, *Commelina benghalensis* with 10 each, *Peperomia pellucida and Eragrostis tenella with 9, Portulaca oleracea, Alternatheria philoxeriodes and Solenostemon monostachyus* with 8 each. The weed species with the least association with cultivated crops is *Pennisetum purpureum*, with 3 crops.

The composition of the weed community in the College of Education associated with farmlands is heterogeneous. The life cycle reveals that 12 of the total weed species are perennial (55%), and 10 are annual (45%). In terms of growth habit, 16 weed species are herbaceous (73%), 4 are grasses (18%), and 2 are sedges (9%). This result revealed that weeds in the College of Education are more herbaceous plants (Table 1).

At the family level, the study revealed that Poaceae with 4 species namely *Eragrostis tenella, Pennisetum purpureum, Poa annua, and Paspalum notatum*, has the most dominant weed species, followed by Asteraceae (*Ageratum conyzoides & Gaunsoga quadriraduata)*, Cyperaceae

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(*Kyllinga bulbosa & Cyperus esculentu)*, Commelinaceae (*Commelina benghalensis & Commelina erecta*, and Amaranthaceae (*Alternanthera sessillis & Alternatheria philoxeriodes)* with 2 species each respectively. This study is in agreement with those reported by Carbonó and Cruz (2005), who highlight the families Poaceae, Fabaceae, Asteraceae and Cyperaceae as those with greater specific richness. Lanza *et al.* (2017) and Moura-Filho *et al.* (2015) also reported Poaceae as the family having the highest specific richness in their studies respectively. Using *A. conyzoides* as a case study, despite its medicinal uses (PROTA, 2016), poses a significant threat as a noxious weed in agricultural land, leading to substantial crop yield reduction and economic losses for farmers. Its impact extends beyond direct crop damage, as it has been identified as an alternative host of several economically important crop pathogens. For instance, Sunaina *et al.* (1989) reported *A. conyzoides* as a symptomless carrier of *Ralsonia solanacearum*, a major potato pest in India. According to GISD (2016), *A. conyzoides* hosts the Tomato Yellow Leaf Curl Tanzania Virus (TYLCTZV) and the Ageratum Yellow Vein Virus. This is particularly concerning as the dominant crops of the study area, such as vegetables, cassava, plantain, cocoyam, and pepper, are not only vital for the local economy but also deeply ingrained in the sociocultural fabric of the community.

The study underscores the weed-crop association and its potential impact on the yield of economically important staple crops in the study area. Weed control is a paramount concern in agriculture to mitigate competition for nutrients, water, and light, which can significantly affect crop yields (Upadhyay *et al.*, 2011). The study area exhibits a rich diversity of weed species,

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necessitating effective weed control strategies to mitigate the impact on agricultural yield. The integrated weed management method, which incorporates cultural, mechanical, biological, and chemical processes, remains a sustainable approach to reducing reliance on any single method. However, given the unique characteristics of each species in terms of biology, ecology, and physiology, further research is imperative to gain a comprehensive, nuanced understanding of the species and adapt these recommended strategies based on local conditions, crop types, and specific weed challenges for optimal results.

CONCLUSION

In conclusion, weed species are a significant challenge to farmers, as they compete with crop plants for essential resources such as water, sunlight, and nutrients. The current study has identified weed species associated with some economically important crops in the study areas. These include, *Oldenlandra corymbosa* having been associated with the total 14 crops, follow by *Ageratum conyzoides* with 12 crops, *Commelina erecta* with 11 crops, *Veronica serpyllifolia, Cyperus esculentus* and, *Commelina benghalensis* with 10 each, *Peperomia pellucida and Eragrostis tenella with 9*, *Portulaca oleracea, Alternatheria philoxeriodes and Solenostemon monostachyus*. Conducting surveys of weed species associated with field crops in farmlands is crucial for understanding the extent of the problem and developing effective strategies for weed management. By understanding the interactions between weeds and crops, farmers can develop more effective weed management strategies. These strategies can help to improve crop yields, reduce costs, and protect the environment.

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REFERENCES

Booth B. D., S. D. Murphy S. D. and Swanton C. J. (2003) Weed Ecology in Natural and Agricultural Systems Wallingford, UK: CABI Publishing, **40**(02):272 – 273.

Campo, A. M, and Duval, V.S. (2014). Diversity and value of importance of vegetation for their conservation Parque Nacional Lihué Calel (Argentina) *Anales de Geografía* **34**(2):25-42.

Carbonó, E, and Cruz, Z. (2005). Identificación de coberturas promisorias para cultivo de banano en la zona de Santa Marta, Colombia. *Rev Intrópica*. **2**(1):7-22.

Chancellor, R. J. and Froud-Williams, R. J. (1982). A survey of grass weeds in Central Southern England. *Weed Res*. **22**: 163-171.

Chancellor, R. J. and Froud-Williams, R. J. (1984). A second survey of cereal weeds in Central Southern England. *Weed Res*. **24**: 29-36.

Chikoye, D, Schulz, S. and Ekeleme, F. (2004). Evaluation of integrated weed management practices for maize in the northern Guinea Savanna of Nigeria. *Crop Protection* **23**:895-900.

Dadari, S.A. and Hamza Mani. 2005. The effect of post-emergence weed control on irrigated wheat in the Sudan savannah of Nigeria. *Crop Protection*. **24**: 842-847.

Ekeleme F., Atser G, Dixon A., Hauser S, Chikoye D., Olorunmaiye P. M., Sokoya G, Alfred J, Moses C. Okwusi, Korieocha D. S., Adeyemi O. Olojede, Toye Ayankanmi & Lagoke S. T. O. (2019). Assessment of Weeds of Cassava and Farmers' Management Practices in Nigeria», *Tropicultura* [En ligne], **37**(2), 2295-801.

Ghersa, C.M, and Ferraro, D.O. (2012). Algunos aspectos acerca de la aparición de resistencia a herbicidas en poblaciones de malezas. *Rev AAPRESID* (Especial Malezas). 21-24.

GISD, 2016. Global Invasive Species Database (GISD).

Hakim, M. A., Juraimi, A. S., Razi, M., Ismail, M., Hanafi, M. and Selamat, A. (2013). A Survey on Weed Diversity in Coastal Rice Fields of Sebarang Perakin Peninsular

Malaysia. *The Journal of Animal & Plant Sciences,* **23**(2): 534-542.

Hassannejad, S. and Ghafarbi, S. P. (2012). Introducing new indices for weed flora studies. *International Journal of Agriculture and Crop Sciences* **4**(22):1653-1659.

Hutchinson, J. and Dalziel, M. D., 1963. Flora of West Tropical Africa, vol. 2. Crown Agents for Overseas Government and Administration, London, 435-436.

Ishaya, D.B., S.A. Dadari, and J.A.Y. Shebayan. 2007b. Evaluation of herbicides for weed control in sorghum (*Sorghum bicolour*) in Nigeria. *Crop Protection*. **26**(11):1697-1701.

Lanza, T.R, Machado, A. and Martelleto, L. (2017). Effect of planting densities of "brs princess" banana tree in the suppression of weeds. *Planta Daninha*. **35**:1-11.

Moura Filho E, Macedo L, Silva A. (2015). Levantamento fitossociológico de plantas daninhas em cultivo de banana irrigada. *Holos*.**2**:92-7.

Nichols, V. Verhulst, N., Cox, R., and Govaerts, B. (2015). Weed dynamics and conservation agriculture principles: a review. *Field Crops Research*. **183**:56-68.

Palumbo, J.C. (2013). Insect weed interactions in vegetable crops. Veg IPM Update **4**(13):1-3.

Pollnac, F, Rew, L. and Menalled, F. (2008). Spatial patterns, species richness and cover in weed communities of organic and conventional no tillage spring wheat systems. *Weed Research.* **48**:398-407.

PROTA, 2016. PROTA4U web database. Wageningen, Netherlands: Plant Resources of Tropical Africa. http://www.prota4u.org/search.asp

Quintero-Pertúz, I., Carbonó-Delahoz, E. and Jarma-Orozco, A. (2020). Weed Associated with Banana Crops in Magdalena Department, Colombia. *Planta Daninha* 38. Doi: 10.1590/S0100-83582020380100015.

Sintayehu, A. (2019). Weed flora survey in field crops of Northern Ethiopia. *Africa Journal of Agricultural research.* **14**(16): 749-758, DOI 10.5897/AJAR 2019.13947.

Storkey J, Neve P. (2018). What good is weed diversity? *Weed Research*. **58**:239-43

Sunaina V, Kishore V, Shekhawat GS, 1989. Latent survival of Pseudomonas solanacearum in potato tubers and weeds. Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz, **96**(4):361-364.

Tena, E. Hiwet A. G. and Dejene, M. (2012). Quantitative and Qualitative Determination of Weeds in Cotton-Growing Areas of Humera and Metema, Northwestern Ethiopia. *Ethiopian Journal of Applied Science Technology* **3**(1):57- 69.

Upadhyay, R.K., Baksh H. and Patra, D.D. (2011). Integrated weed management of medicinal plants In India.

https://doi.org/10.61448/njse222242

International Journal of Medicinal and Aromatic Plants **1**(2):51-56.

Vissoh, P.V., G. Gbehounou, A. Ahanchede, T.W. Kuyper, and N.G. Roling. 2004. Weeds as Agricultural Constraint to Farmers in Benin: Results of a Diagnostic Study. *NJAS*. **52**(3/4):305-329.

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