Morphology and pH of *Achyranthes aspera* L. found within Aliero local government, Kebbi State, Nigeria

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Abstract

This research aimed to study the Morphology and pH of *Achyranthes aspera* L. found within Aliero Local Government Kebbi State, Nigeria. Ten samples (10) samples in ten (10) collection areas were collected and transported to Botany Laboratory, Kebbi State University of Science and Technology Aliero for analysis. Plant species collected were identified as *Achyranthes aspera* by a Taxonomist. Analysis of the soil pH was done using an electrode. The result of the study revealed that Sabiyal species were the tallest species (92.800±1.58) while the shortest species were seen in Jiga Birni (64.333±5.13). Sabiyal area had the highest number of plants species (316.67±2.88) while Aliero Dangaladima I had lowest number of species (94.667±8.38). The highest leaf area was seen in Sabiyal (16.367±0.56) while Jiga Birni had the lowest leaf area (10.333±0.51). Sabiyal had the highest number of flower occurrence (118.00±11.13) while Jiga Makera had the lowest number of flower occurrence (62.000±7.21). Sabiyal species are the widest plants in the study (6.100±0.52) while Jiga Makera had the least wide species in this research (4.767±0.72). Sabiyal species had the highest number of fruits (803.33±3.215) while Aliero Dangaladima had the lowest number of fruits (601.00±87.069). The results of pH values of *Achyranthes aspera* plants showed that Kashin Zama species had the highest pH (7.027±0.02), followed by Danwarai (6.813±0.00), Sabiyal (6.707±0.00), Rafin Bauna (6.430±0.01), Aliero Dangaladima II (6.413±0.01), Aliero Dangaladima I (6.020±0.01), Aliero S. Fada I (5.627±0.02), Aliero S. Fada II (5.483±0.00), Jiga Makera (5.220±0.01) and Jiga Birni (4.670±0.01). It was discovered from the results of this study that *Achyranthes aspera* found in Aliero Local Government Kebbi State, Nigeria produced a large number of fruits, flowers, leaves and have level of pH that is less than 7.0 and are said to be acidic in nature. In view of this, further research should be conducted in order to know the mineral and proximate composition of these species in Aliero Local Government, Kebbi State, Nigeria.

Keywords: *Achyranthes*, aliero, annual and amaranthaceae

Introduction

Achyranthes aspera L. is an annual herb belonging to Amaranthaceae family. It has been used for thousands of years in medicinal practices and to some extent as food constituent also. The genus *Achyranthes* contain 8 to 15 species (Baraik, 2014) [2]. The exact number of species of the genus Aspera is uncertain because of huge variability among the constituent species. Variability is prevalent in morphology, growth habit, flower color, leaves, stems and chemical composition. Chaff flower can cross pollinate easily and they also reproduce by self-pollination. The name of this plant is varies in different regions of the world. It is called as "Chaff Flower" in English (Srivastav, 2011) [12].

Diversity of plant genus and species are existing in the world today and each of the plants have its own nature of the roots, stem, flowers, seeds, habitat and general nature of morphological arrangement. The plants may be either the seeds plants or seeds less plants. The species of *Achyranthes aspera* L. can be found distributed all over the world in absence of shade or in semi-shade (light woodland). It requires moist soil but prefers light sandy, medium loamy, heavy clay soils for its growth, it grows as wasteland herb everywhere (Fern, 1996) [4].

Achyranthes aspera L. is an erect herb, ranging between 0.3 to 0.9 m height, stem stiff, branched stems are angular, ribbed and simple or branched from the base, often with tinged purple colour, and branches are quadrangular with thick leaves. The leaves are opposite, velvety, tomentose and obovate, margins wavy, surface covered with whitish hair. Petiole shows crescent shaped outline, having single layered epidermis with thick cuticle. Midrib shows a single layered epidermis, and on both surfaces, epidermis followed by 4-5 layered collenchyma on upper side and 23 layered on lower side (Sharma and Chaudhary, 2015) [11].

The flowers are bisexual, greenish-white and are arranged in a spike form. The bracts surround the flower in the fruiting stage and have sharp pointed tips making the head spiny to touch. Stamen 2-5, filament filiform, monoadelphous, alternating with quadrate (Zafar, 2009) [14]. Style slender, stigma small capitate and ovary is with pendulous ovule. Stem shows 6-10 ridges, which diminish downward to the base where it become almost cylindrical, epidermis single layered, covered by thick cuticle having uniseriate, 2-5 celled covering trichomes. Cortex is 6-10 layered, composed of parenchymatous cells. A distinguishing feature in both the root and stem is the anomalous secondary growth. Fruits are indehiscent dry utricle enclosed within persistent, perianth and bracteoles. It has one seeded nut or utricle (Zafar, 2009; Sharma and Chaudhary, 2015) [14, 11].

Achyranthes aspera L. commonly known as “Hakorinmaciji” in Hausa belongs to family Amaranthaceae. Since the ancient times the tribal and rural people use this herb in a variety of

disorders. According to Ayurveda (2018), it is bitter, pungent, laxative, stomachic, carminative and useful for the treatment of vomiting, bronchitis, heart disease, piles, itching, abdominal pain, ascites, dysentery, blood disease etc. (Bhandari, 1990; Perumalsamy *et al.*, 1998) [3, 8]. Different parts of the plant are used as ingredient in many native prescriptions in combination with more active remedies (Agharkur, 1991) [1].

However, its highly esteemed by traditional healers and used in treatment of asthma, bleeding, in facilitating delivery, boils, bronchitis, cold, cough, colic, debility, dog bite, dysentery, ear complications, headache, leucoderma, pneumonia, renal complications, scorpion bite, snake bite and skin diseases (Jain and Singh, 2010) [5]. Crushed plant is boiled in water and is used in pneumonia. Infusion of the root is used in bowel complaints. Decoction prepared from the whole plant is given for inflammatory conditions of the body. Root decoction is helpful to cure abdominal disorders. The dried leaf powder (2-5 gm) is taken with honey for diarrhea. Leaf juice is useful remedy for skin diseases like prutitis and scabies. Leaf paste is applied externally for toxic bites. Whole plant ash is a good remedy for bleeding piles and abdominal problems. Root of *Achyranthes aspera* L. is used to clean the mouth and to cure halitosis. Infusion of twig is also used as a wash for toothache. Root extract is used as an eye drop at bed time for night blindness (Raji, 2013) [10].

Aliero local government has diversification of different plant species range from trees, shrub and herb and use by the inhabitants to treat various diseases upon the availability synthetics drugs. Many herbs and spices contribute significantly to health despite the low amount of consumption, as they are full of antioxidants and certain mineral compounds. It is not evident that how much chaff flower should be used to gain its health benefits. Researchers do not have any particular recommendations about precise amount of use; nevertheless, chaff flower is full of antioxidants, in addition to this it is also a good source of certain minerals and dietary fiber. Chaff flower has bitter taste, so it is not used in food. Chaff flower (*Achyranthes aspera* L.*)* distributed in the study at different ecological area but morphological features and pH of this species are very scarce. Hence, this research aimed to study the Morphology and pH of *Achyranthes aspera* L. found within Aliero Local Government Kebbi State, Nigeria.

Materials and Methods

Achyranthes aspera L. collection

Samples of the *Achyranthes aspera* L. plant were collected during rainy season in the year 2022 by uprooting method with care to ensure minimum damage to the plant's organs. The details such as date, location, time of collection, common name and local names etc. was recorded in a field note book. The plant collected was taken to the herbarium section Department of Plant Science and Biotechnology, Kebbi State University of Science and Technology Aliero, Kebbi State for proper identification.

Taxonomical identification *Achyranthes aspera* L.

The *Achyranthes aspera* L. was subjected to taxonomical identification in Herbarium based on the morphological and floral characteristics such as inflorescence, flower type, leaf morphology and leaf arrangement by a taxonomist. After identification, voucher numbers of plant were issued and voucher specimens deposited in the herbarium for future reference.

Morphological study of *Achyranthes aspera* L.

Ten matured *Achyranthes aspera* L. species were observed and measured from each ward site as (Aliero Dangaladima 1, Aliero Dangaladima 2, Aliero S. Fada1, Aliero S. Fada1, Danwarai, Jiga Birni, Jiga Maker, Kashin Zama, Rafin Bauna, Sabiyal) for the physical appearances study. A ruler was set at the base of the plant at zero on the bottom and then the highest point of *Achyranthes aspera* L. was measured and recorded. Number of leaves include new leaf tips and sprouts per plant was counted extremely thoroughly to avoid counting the same leaves twice. Also, the ruler was hold from the bottom to the tip of the leaf to measure the length and width of the *Achyranthes aspera* L. leave. Moreover, number of fruit, flower and root per plant was counted too (Singh, 1966; Teena and Yadav, 2005) [13]. All the measurement was done in cm3 and in three replicates.

Determination of soil pH

The soil pH was determined using an electrode (Piper, 1942) [9]. Ten grams (10g) of each soil collected from each ward was inserted into 10ml of distilled water into 100ml beakers each. The suspension was stirred several times with the glass rod for thirty (30) minutes. An electrode was washed with distilled water and wiped with soft paper before inserted into the suspension. pH was record after pressing the appropriate knots in a three replicate.

Results and Discussion

Results

Morphological studies of *Achyranthes aspera* plants

The results of morphological studies of *Achyranthes aspera* plant are presented in Table 1. From the results, it can be seen that *Achyranthes aspera* plants collected from Sabiyal were the tallest species (92.800±1.58) while the shortest species were seen in Jiga Birni (64.333±5.13). Sabiyal area had the highest number of plants species (316.67±2.88) while Aliero Dangaladima I had lowest number of species (94.667±8.38). The highest leaf area was seen in Sabiyal (16.367±0.56) while Jiga Birni had the lowest leaf area (10.333±0.51). Sabiyal had the highest number of flower occurrence (118.00±11.13) while Jiga Makera had the lowest number of flower occurrence (62.000±7.21). Sabiyal species are the widest plants in the study (6.100±0.52) while Jiga Makera had the least wide species in this research (4.767±0.72). Sabiyal species had the highest number of fruits (803.33±3.215) while Aliero Dangaladima had the lowest number of fruits (601.00±87.069).

Table 1: Morphological studies of *Achyranthes aspera*

Areas	Height	No. of pp	Leaf area	No. of fl	Width	No. of fruit
Aliero Dangaladima I	65.090±1.03	94.667±8.38	10.700±0.43	80.000±1.00	5.367±0.55	601.00±87.069
Aliero Dangaladima II	69.400±0.96	102.67±4.04	12.160±1.05	82.000±6.24	4.933±0.15	675.67±15.631
Aliero S. Fada I	89.667±3.01	297.67±8.08	14.233±0.46	95.333±6.50	5.367±1.12	699.67±4.163
Aliero S. Fada II	68.333±2.93	107.67±15.37	10.200±0.70	68.000±2.64	5.133±0.15	632.67±42.771
Danwarai	83.000±3.60	228.00±24.88	12.567±0.57	91.667±2.51	5.600±0.65	760.00±46.119
Jiga Birnin	64.333±5.13	99.667±2.51	10.333±0.51	79.333±1.52	5.233±0.25	697.67±17.502
Jiga Makera	70.000±1.73	103.67±3.05	10.967±1.22	62.000±7.21	4.767±0.72	664.00±22.539
Kashin Zama	71.333±12.29	104.00±19.69	11.167±0.37	75.000±3.00	5.067±0.15	674.33±38.65
Rafin Bauna	92.533±2.83	304.67±5.50	15.667±0.41	104.33±5.03	5.700±1.53	792.00±9.165
Sabiyal	92.800±1.58	316.67±2.88	16.367±0.56	118.00±11.13	6.100±0.52	803.33±3.215

Soil pH level of *Achyranthes aspera* plants

The results of pH values of *Achyranthes aspera* plant are presented in Table 2. From the results, it can be seen that Kashin Zama species had the highest pH (7.027±0.02), followed by Danwarai (6.813±0.00), Sabiyal (6.707±0.00), Rafin Bauna (6.430±0.01), Aliero Dangaladima II (6.413±0.01), Aliero Dangaladima I (6.020±0.01), Aliero S. Fada I (5.627±0.02), Aliero S. Fada II (5.483±0.00), Jiga Makera (5.220±0.01) and Jiga Birni (4.670±0.01).

Table 2: Soil pH level of *Achyranthes aspera* plants

Areas	pH level
Aliero Dangaladima I	6.020±0.01
Aliero Dangaladima II	6.413±0.01
Aliero S. Fada I	5.627±0.02
Aliero S. Fada II	5.483±0.00
Danwarai	6.813±0.00
Jiga Birnin	4.670±0.01
Jiga Makera	5.220±0.01
Kashin Zama	7.027±0.02
Rafin Bauna	6.430±0.01
Sabiyal	6.707±0.00

Discussion

Findings of the morphological studies of *Achyranthes aspera* indicated that the plants species grow wide with a large number of fruits, leaves and flowers in Aliero Local Government, Kebbi State, Nigeria. This might be due to nature of the plant to survived in the tropical part of the world. The analysis of the Soil pH level revealed that the soil is mostly acidic with a pH below 7.0. Only soil from Kashin Zama is found to have pH level above 7.0 and are found to be alkaline.

Achyranthes aspera (Chaff-flower) is a species of plant in the family Amaranthaceae. It is distributed throughout the tropical world. It can be found in many places growing as an introduced species and a common weed. It is an invasive species in some areas, including many pacific islands environments (Nardi, 2007) [7]. The stem is herbcious but woody below, erect, branched, cylindrical, solid, angular, green but violet or pink at nodes. Leaves are ramal and cauline, simple, estipulate, opposite, ovate or obovate, entire, acute or acumunate, hairy all over, unicostate reticulate (Maiden, 1998) [6].

The juice of the plant is a potent ingredient for a mixture of wall plaster. It is used as medicine in different part of the world including Australia. The flowering spikes, rubbed with a little sugar are made into pills, and given internally to human being bitten by mad dogs (Maiden, 1998) [6]. The leaves taken fresh and reduced to a pulp are considered a good remedy when applied externally to the bites of scorpions. The ashes of the plant yield a considerable quantity of potash, which is used in washing clothes. The flowering spike has the reputation of being safeguard against scorpions which is believed to paralyze (Nardi, 2007) [7].

Conclusion

It was discovered from the results of this study that *Achyranthes aspera* found in Aliero Local Government Kebbi State, Nigeria produced a large number of fruits, flowers, leaves and the soil have level of pH less than 7.0 and are said to be acidic in nature. In view of this, further research should be conducted in order to know the mineral and proximate composition of these species in Aliero Local Government, Kebbi State, Nigeria.

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