PHYTOCHEMICAL COMPOSITIONS OF THE LEAVES OF CHICKEN WEED (*Portulaca quadrifida* L.) AS INFLUENCED BY DIFFERENT SOIL TEXTURAL CLASS IN NORTH WESTERN NIGERIA.

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ABSTRACT
The importance of weeds as herbs in the management of human ailments cannot be overemphasized. Pot experiment was carried out at the Biological garden of the Usmanu Danfodiyo University Sokoto, Nigeria during the 2017 and 2018 rainy season to examine the potentials of different soil textural class on the phytochemical composition of Chicken weed (*Portulaca quadrifida*). The experiment consisted of three different soil type (sand, silty clay and loamy sand) and plant material as stem cuttings from chicken weed (NLA-D, NLR-D, NLA-P, NLR-P, IN-D, IN-P and SRA). The experiment was laid out in Completely Randomized Design (CRD) replicated three times. Results showed that flavonoid, saponins, glycosides and alkaloids were influenced in the different soil textural class evaluated. Steroids and Anthraquines were not present in all the plant treatments evaluated and IN-D and IN-P did not regenerate. These findings showed that, the presence of flavonoids, saponins, glycosides and alkaloids in the leaves of Chicken weed were more revealing in all the soils used for the growth of the plant in this study. It is therefore recommended to grow Chicken weeds as a vegetable for its vast phytochemical compositions.
Keywords: chicken weed, phytochemical, stem cuttings, soil textural class

INTRODUCTION
The genus of *Portulaca* is an annual herb which taxonomically belongs to the family of *Portulacaceae* (Lei *et al.*, 2015). The genus *Portulaca* contains about 150 species, but 30 of the species occur in Africa, though opinion on species description differs considerably (PROTA, 2014). The taxonomic ranking to which *P. quadrifida* belongs is shown below.

Kingdom	Plantae
Phylum	Spermatophyta
Subphylum	Angiospermae
Class	Caryophyllales
Family	Portulacaceae
Genus	*Portulaca*
Species	*Quadrifida*

Source: PROTA, 2014.

Portulaca quadrifida originates from India, and has been widely distributed in other temperate and tropical areas of the world (Lei *et al.*, 2015 and Zhou, 2015). Netala *et al.* (2014) reported that the botanical name is derived from the Latin *Potare*, meaning to "carry," and *Lac* or "milk", referring to the milky sap of the plant. *Portulaca quadrifida* belongs to the family *Portulacaceae*. (Nyffeler and Eggli, 2010). The weed has been known by a number of other synonyms (*Illecebrum verticillatum L., Portulaca formosana* (Hayatta), *Portulaca meridiana* L.f., *Portulaca microphylla* A. Rich. *and Portulaca walteriana*), but the original Linnean name persists and there is no confusion with any closely related species. Therefore, it is regarded as a variable species and occurs in a number of different ploidy forms (2n= 18, 36, 48) (PROTA, 2014).

According to Maroyi (2013) weeds are useful to human beings as food and traditional medicines. Edible weeds could contribute in many ways to basic primary health care, food security, balanced diets of rural and urban households.

Alikwel *et al*. (2014) described phytochemicals as those substances found in plant foods that are not essential nutrients but may have health promoting properties. Phytochemical components are responsible for both pharmacological and toxic activities in plants (Margaret and Vickery, 1997). These chemical volatiles have functions in chemical defense, acting as insecticides, acaricides, avoiding bacterial or fungi phytopathogen colonization and attracting natural enemies of herbivores (Bakali *et al*., 2008; Yadav *et al*., 2008; Karamanoli *et al*., 2005; Iacobellis *et al*., 2005). These metabolites are said to be useful to a plant itself but can be toxic to animals including man if consumed in large quantities (Alikwel *et al*., 2014). Kawo *et al*. (2009) also added that phytochemical components are responsible for both pharmacological and toxic activities in plants. The findings of Raimundo (1999) and Edoega *et al*. (2005) revealed that, phytochemicals, particularly the secondary metabolites (such as alkaloids, anthraquinnones, cardiac glycosides, saponins, tannins, xanthones, flavolignans, terpenoids, coumarins, lignans, cinamic acids, e.t.c). are not only studied for their health benefits but for their significant roles in the complex interactions between microbes, animals and plants in the ecosystems. Das and Ashok (2013) reported the preliminary phytochemical analysis of different extracts in petroleum ether extract with positive results as tannins, flavonoids and triterpenoids. The chloroform extract showed positive test for tannins only, ethanolic extract exhibited positive test for alkaloids, flavonoids, triterpenoids, glycosides,

tannins, amino acids and saponins whereas aqueous extract was found to be positive for flavonoids, alkaloids, carbohydrates, glycosides, amino acids and saponins. Verman *et al*. (2016) reported that components such as alkaloids, tannins, flavonoids, terpenoid, glycosides and steroids were present in *Portulaca quadrifida*. This study was therefore conducted to examine the potentials of different soil types on phytochemical composition of chicken weed.

MATERIALS AND METHODS

Soil sample collection

Mass collection of soils, predominantly sand, clay and loamy were collected from the dry land experimental farm of Usmanu Danfodiyo University, Sokoto, Teaching and Research Fadama Farm located at Kwalkwalawa during 2017 and 2018 rainy seasons. Each soil types were individually mixed together and 500g of sample from each sample collection was used for physical and chemical composition of the soil using standard solution. The analysis showed that the soils were sand, silty clay and loamy sand. The three soil textural class stand as a treatment in this study. Sokoto lies between latitude 12^0 01′ N and 13^0 58′ N and longitude 4^0 8′ E and 6^0 54′ E (Mamman *et al*., 2000) in the Sudano sahelian agro-ecological Zone of Nigeria.

Collection of sample

Matured plants of Chicken weed were collected randomly across farmer's field at Birnin Kebbi during the rainy seasons of 2017 and 2018. The plant samples were cut into different parts to stand as treatments thus; (NLA-D - node leaf attached at distal stem location, NLR-D- node leaf removed from distal stem location, NLA-P- node leaf attached at proximal stem location, NLR-P- node leaf removed from proximal stem location, IN-D internodes at distal stem location, IN-P- internodes from proximal stem location and SRA- stem roots attached). Birnin Kebbi lies on latitude 12°25'N and longitude 4°15'E. Gindi *et al*. (2013) reported that Birnin Kebbi enjoys a tropical type of climate generally characterized by annual temperature range of 25-40 °C with mean annual rainfall of about 500-700 mm.

Agronomic practice

The experiment consisted of twenty one plastic pots (25 cm × 24 cm) filled with equal volume (10 kg) of the three soil types (sand, silty clay and loamy sand) and three stands of stem cutting type of Chicken weed as treatments. Three stem cuttings were planted on each experimental pot and the pots containing different soil types were irrigated a day before planting. The experiment was laid out in a Completely Randomized Design replicated three times. To enhance survival of the experimental plants, the pots were uniformly supplemented with additional moisture by irrigation the plants every 2 – 3 days intervals depending on the availability of rain fall in the experimental area. Weeds that grew together with Chicken weed in the experimental pots were handpicked. There was no incidence of pests or diseases on the experimental pots throughout the study period. Therefore, there was no pest or disease control practice carried out.

Harvesting

Chicken weed plant from each pot was harvested at 60 days after planting by completely uprooting the entire plants. The plants were properly washed off the soil and rinsed with clean water, drain dry and weighed for estimation of fresh weight. For the purpose of this study, fresh leaves of the weed from each soil textural class were enclosed in an envelope and oven dried to a constant weight at 70^0C in the laboratory. The samples were grounded into powdered form and used for phytochemical analysis using standard procedures in the laboratory.

Phytochemical Screening of *P. quadrifia*

Accurately 5g of the powdered sample of the plant material (*P. quadrifida*) was macerated in 100ml of distilled water for 24 hours and filtered through a filter paper. The filtrate serves as the aliquot that was used for the detection of the phytochemical composition in this study. Phytochemical compounds such as Flavanoid, Tannins, Saponins, Glycosides, Alkaloides, C. glycosides, Steroids, S. Glycoside, Balsam and Anthraquines from the plant sample were determined using standard methods as follows:

Test for flavonoids

Exactly 3 ml aliquot of the filtrate and 1ml of 10% NaOH (Sodium hydroxide) were added in a test tube and shaken. A yellow colour was developed, this indicated the possible presence of flavonoids compounds (El-Olemy *et al*; 1994)

Test for tannins

A 5% Ferric chloride solution was added drop by drop in to a test tube containing 3ml of the plant extract (*P. quadrifida*) and the green colour was observed. This showed the presence of tannins (Harborne, 1998, Trease and Evans, 1989).

Test for saponin

Exactly 5ml of extract was placed in a test tube with addition of 5ml of water and shaken strongly. A foam layer was obtained on the top of the test tube. This foam layer indicated the presence of saponins (Harborne, 1998).

Test for glycosides

Exactly 2.5ml of 50% H_2so_4 was added to 5ml of the extract in a test tube. The mixture was heated in boiling water for 15 minutes, after cooling, it was neutralized with 10% NaOH, 5ml of fehling's solution was added and the mixture was boiled. A brick-red precipitation was observed which indicated the presence of Glycosides (Harborne, 1973).

Test for alkaloid

This was determined using the Harborne (1973) method. Exactly 2ml of the extract was stirred with 2ml of 10 % aqueous hydrochloric acid. 1ml was then treated with a few drops of wagners reagent and

secondly, 1ml portion was treated similarly with mayers reagent. Turbidity or Precipitation with either of these reagents was taken as preliminary evidence for the presence of alkaloids.

Test for cardiac glycosides (Killer-Killiani's test

To the test tubes containing 1ml of the plant extract, 3.5 % ferric chloride solution was added` and allowed to stand for one minute. Then 1ml of concentrated H_2So_4 was carefully poured down the wall of the tube and observed, disappearance of reddish brown colour at the junction of the two layers and bluish green in upper layer indicated the presence of cardiac glycosides.

Test for steroids (Salkowski)

This was carried out according to the method of Harborne (1973). Exactly 0.5g of the extract was dissolved in 2ml of chloroform and 2ml of sulphuric acid was carefully added to form lower layer. A reddish brown colour at the inter face indicated the presence of a steroidal ring.

Test for S. glycosides

Exactly 2.5ml of the extract was measured into a test tube and added 2.5ml fehing's solution A and B, a bluish green precipitate showed the presence of saponin glycosides (El-Olemy *et al*., 1994).

Test for balsams

Plant extract was mixed with equal volume of 90% ethanol and 2 drops of alcoholic ferric solution was added to the mixture. A dark green colour indicates the presence of balsams (El-Olemy *et al*., 1994).

Test for anthraquines

Exactly 0.5g of the plant extract is shaken with 10ml benzene and 5ml of 10% ammonia solution -was added. The mixture was shaken and the presence of a pink, red or violet colour in the ammoniac (lower) phase indicated the presence of anthraquinones

RESULTS

The result on physical properties of soils showed that sample A was Sand (92.2%) and moderately alkaline (pH 7.7), sample B was silty clay (29.4%) and neutral (pH 6.8), while sample C was loamy sand (82.4%) and moderately alkaline (pH 7.3). For the chemical compositions, organic carbon was low in sandy and silty clay (0.04 and 0.96 – 1.0 g kg^{-1}) respectively. Total nitrogen for sandy, silty clay and loamy sand were low (0.025, 0.081 and 0.039 %) respectively. Available phosphorus and exchangeable bases were also low.

Phytochemical screening of *P. quadrifida* in 2017 and 2018

Phytochemical analysis of *P. quadrifida* as influenced by soil textural class and stem cuttings in 2017 are presented in Table 1. The result showed that Flavonoids, Saponins, Glycosides and Alkaloids were influenced by the soil textural classes such that all the stem cuttings tested had the presence of the chemical composition. Tannins were not influenced by stem cuttings from NLA-P and NLR-P when planted in sandy soil, NLR-D in silty clay and NLA-D and NLA-P with loamy sand respectively, while stem cuttings from NLA-D, NLR-D and SRA were influenced by sandy soil and NLA-D, NLA-P, NLR-P and SRA were also influenced by silty clay soil, while NLR-D, NLR-P and SRA were influenced by loamy sand, except IN-D and IN-P. Cardiac glycosides were influenced with stem cuttings from NLR-D when sandy soil was used, while NLA-D and NLR-P were better with loamy sand. Steroids and Anthraquines were not present in all treatments, though steroids was present from stem cuttings with NLA-P in silty clay. The absence of Saponin Glycoside was noticed when NLR-D were planted in sandy soil, while sandy soil and loamy soil did not favour NLR-P, likewise SRA in silty clay and loamy sand did not produced S. Glycosides in *P. quadrifida.* S. Glycosides was present in NLA-D NLA-P and SRA when planted in sandy soil. Silty clay also produced S. Glycoside in stem cuttings with NLA-D, NLR-D and NLR-P, while in loamy sand, S. Glycoside were present in NLA-D, NLR-D and NLA-P. Balsam was observed in stem cuttings with NLR-P in sandy soil, NLA-D, NLR-D and NLR-P in silty clay, while loamy sand produced Balsam when stem cuttings with NLR-D and NLR-A were used.

However, phytochemical analysis of *P. quadrifida* as influenced by soil textural class and stem cuttings in 2018 was presented in Table 2 which revealed that similar trends of results was observed as reflected in 2017 except that Steroids was recorded in stem cuttings with NLA-P planted in loamy sand soil, while S. glycosides was negative (absent) in NLR-P and presence of S. glycosides in SRA planted under silty clay and loamy sand soils respectively.

Table 1: Influence of soil textural class and stem cuttings on phytochemical composition of *P. quadrifida* during the 2017 rainy season at Sokoto

	Flavonoid			Tannins			Saponins			Glycosides			Alkaloids			C. glycosides			Steroids			S. glycoside			Balsam		Anthraquines			
Stem cuttings	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
NLA-D	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	-	-	+	-	-	-	+	+	+	-	+	-	-	-	-
NLR-D	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	+	+	-	+	+	-	-	-
NLA-P	+	+	+	-	+	-	+	+	+	+	+	+	+	+	+	-	-	+	-	+	-	+	-	+	+	-	+	-	-	-
NLR-P	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-
IN-D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IN-P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SRA	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-

Key: Soil samples: - A= Sandy soil, B = Silty clay soil and C= Loamy sand soil (+) = Present and (-) = absent. Node leaf attached at distal stem location (NLAD); Node leaf removed from distal stem location; NLR-D; Node leaf attached at proximal stem location; (NLA-P); Node leaf removed from proximal stem location (NLR-P); Internodes at distal stem location (IN-D); Internodes from proximal stem location (IN-P) and Stem roots attached (SRA).

Table 2: Influence of soil textural class and stem cuttings on phytochemical composition of *P. quadrifida* during the 2018 rainy season at Sokoto

	Flavonoid			Tannins			Saponins			Glycosides			Alkaloids			C. glycosides			Steroids			S. Glycoside			Balsam		Anthraquines			
Stem cuttings	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
NLA-D	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	-	-	+	-	-	-	+	+	+	-	+	-	-	-	-
NLR-D	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	+	+	-	+	+	-	-	-
NLA-P	+	+	+	-	+	-	+	+	+	+	+	+	+	+	+	-	-	+	-	+	+	+	-	+	+	-	+	-	-	-
NLR-P	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
IN-D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IN-P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SRA	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-

Key: Soil samples: - A= Sandy soil, B = Silty clay soil and C= Loamy sand soil (+) = Present and (-) = absent. Node leaf attached at distal stem location (NLAD); Node leaf removed from distal stem location; NLR-D; Node leaf attached at proximal stem location; (NLA-P); Node leaf removed from proximal stem location (NLR-P); Internodes at distal stem location (IN-D); Internodes from proximal stem location (IN-P) and Stem roots attached (SRA).

DISCUSSION

The low level contents of organic carbon, total nitrogen and available phosphorus in all the soils in this current study, agreed with the report of Shehu *et al* (2015) who reported that selected soils in Sudan Savanna are low in organic carbon, total nitrogen and available P. Phytochemical analysis of *P. quadrifida* revealed that flavonoids, saponins, glycosides and alkaloids were influenced by all soil textural classes. Amsalu, N, and Asfaw, Z. (2020) reported that, the most common classes of these chemicals are saponins, tannins, anthraquinones, flavonoids and alkaloids, which are widely distributed amongst various plant families in abundant quantities. Other metabolites (Taninns, C. Glycosides, S. Glycosides, Basalm) are mixed up in soil textural classes. Steroids and Anthraquines were not influenced by all the soil textural class. Netala *et al*. (2014) reported that the qualitative phytochemical screening of Portulaca revealed the presence of alkaloids, carbohydrates, saponins, steroids and triterpenoids. Musa *et al.* (2006) revealed that the Preliminary phytochemical analysis of different extracts of *P. quadrifida* showed presence of tannins, phenolic compounds, flavonoids and triterpenoids in petroleum ether extract. Tannins was revealed when chloroform extract was used only, ethanolic extract exhibited positive test for alkaloids, flavonoids, triterpenoids, glycosides, tannins, amino acids and saponins, while aqueous extract was found to be positive for flavonoids, alkaloids, carbohydrates, glycosides, amino acids and saponins. Result of similar studies on the phytochemical screening of *Adenanthera pavonina* L. also revealed the presence of tannins, proteins, alkaloids, glycosides, lignin, cellulose etc (Partha and Rahaman, 2015).

However, in all ramifications IN-D and IN-P of *P. quadrifida* was not influenced by the application of soil textural class and therefore did not regenerate after propagation in this study. Similar experiment was conducted by Proctor *et al.* (2011) who stated that L-P (leaf from proximal location), IN-P (internodes from proximal location) and IN-D (internodes from distal location) resulted in $\leq$ 7% survival. The aforementioned authors also stated that the 7% of the L-P cuttings that survived were likely a result of the petiole being cut too close to the stem and part of the node was removed along with the leaf. The presence of these constituents confirms that the plant exhibit both medicinal and physiological activities (Sofowora, 1993). The presence of alkaloids, carbohydrates, glycosides, flavonoids and phenols has been reported to be present in selected medicinal plants used in Gujrat (Khalid *et al*, 2018). It has been stated in many literatures that plants rich in tannins exhibit anti-diarrhea activity, anti-inflammatory and antioxidant activity. Saponins, flavonoids, glycosides and alkaloids found in this present study are known to be behind the anti-microbial activities, anti-fungal, anti-allergenic, anti-pasmodic and anti-inflamatory properties of medicinal plants. Alkaloids are known to aid in anti-diuretic activity of medicinal plants (Khalid *et al*, 2018).

CONCLUSION

Chicken weed have been used in Indian and other Asian countries to cure the sick and it is also used as a vegetables. The potentials have not really been investigated in our community, but based on these findings, Chicken weed is loaded with flavonoids, saponins, glycosides and alkaloids and these could contribute to our livelihood by providing protection against diseases. These substances may also decrease incidence of diet-related cancer or limit the growth of cancer cells.

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