COMPARATIVE EVALUATION ON PHYTOCHEMICAL CONTENTS OF *CAPSICUM ANNUUM L.* AND *CAPSICUM FRUTESCENS L.*

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ABSTRACT

As an additional tool for proving their phylogenetic relatedness and for breeding purposes, the variations in the phytochemical contents and antioxidant activity of four varieties of the two closely related farmed *Capsicum* species, C. *Annuum* and C. frutescens, were examined. The strategy involved measuring the phytochemical and antioxidant properties using ethanolic and aqueous extractions. The antioxidant activities were assessed by 2,2-diphenyl-1-picrylhydrazyl (DPPH), 2,2-azino-bis(3-ethylbenzothiazoline)-6-sulfonic acid (ABTS), nitric oxide (NO), and phosphomolybdenum assays, while the phytochemical contents, including total flavonoid, total phenol, and proanthocyanidins, were evaluated spectrophotometrically. Using the unweighted pair group technique with arithmetic mean (UPMGA) cluster analysis, a dendrogram based on the oxidative photochemical contents of ants was created to highlight the relationships between the types. Overall, ethanolic extracts had higher phytochemical content across all cultivars while aqueous extracts produced better yield. Regarding the cultivars' antioxidant activity and phytochemical contents, significant variances were found. The two Capsicum species were distinguished using dendrograms created by multivariate analysis. The two clusters showed the three variants of the C. Annuum species in subclusters, indicating the strong genetic affinity between the three types, while the first cluster contained just C. frutescens var. baccatum. It also demonstrated the shared lineage of the four kinds. Information from this study provides baseline data for the choice of suitable parental genotypes in breeding for nutritional and therapeutic goals as well as additional validation of the importance of chemotaxonomic traits.

Keywords: Phytochemical,*Capsicum, Capsicum Annuum L*

INTRODUCTION

The Solanaceae family genus Capsicum, which includes pepper, chilli, and chilli, is linked to tomato, eggplant, potato, and tobacco. Twenty seven species of plants make up the genus Capsicum, including five domesticated and twenty two wild varieties (Bosland, 1993). 1993 (Bosland). 1993 (Bosland). The pepper species *Capsicum* genus, *Capsicum* baccatum, and Capsicum pubescens are regarded as domesticated varieties. Peppers come in a wide variety and can be categorized by the trade based on their intended usage. Peppers of the genus Capsicum, primarily *Capsicum Annuum* and, to a lesser extent, Capsicum frutescens, are used for their

distinctively spicy flavor.

The commercial value of red pepper is vital for the agricultural industry, but it also has nutritional and therapeutic benefit. They are the main source of antioxidants and naturally occurring colors (Howard et al., 2000). (2000) (Howard et al.). (2000) (Howard et al.). Pepper has a wide range of phenolic chemicals, carotenoids, and antioxidant vitamins. By preventing a number of human ailments, the consumption of these chemicals in food is a significant health-protecting element. Red peppers may provide significant amounts of beneficial antioxidants to the human diet if usage rises (Marin et al., 2004). (2004) Marin et al. (2004) Marin et al.

Many pepper varieties thrive year-round in Nigeria, just like in other tropical nations. Nigerians' diets place a significant emphasis on pepper. Among the pepper species eaten in Nigeria are the Long chilli pepper (Capsicum genus), Drum pepper (*Capsicum Annuum*), and Little chilli pepper (Capsicum frutescens). Their benefit in nutrition has not been fully exploited. The public's nutritional education will benefit from knowing the nutritional value of different types of pepper as a tool to improve the population's nutritional status. In this study, we looked into the peppers consumed in Nigeria in terms of nutrition, phytochemistry, and microbiology.

MATERIALS AND METHODS

Plant material gathering and growth are the four varieties of Capsicum annuum and Capsicum frutescens that are produced in India were harvested as ripe fruits from markets in various regions. Fruit seeds were first removed, sun dried for three days, stored in paper bags for two weeks at room temperature, around 15 to 30 C, and then used for planting. At the University of Fort Hare's Greenhouse, planting was done in plastic pots between September 2017 and February 2018. All experimental varieties' voucher specimens were placed in the herbarium at the University of Ilorin, with the voucher numbers UIH 001/532, UIH 002/532, UIH 003/532, and UIH 004/751 for C. annuum vars. abbreviatum, acuminatum, grossum, and baccatum, respectively. Four different varieties of Capsicum spp. ripe fruits were collected, and the concentrations of total phenols, flavonoids, and proanthocyanidins were quantitatively analyzed. The assays for DPPH, ABTS, NO, and phosphomolybdenum are used to measure antioxidant activity.

DETERMINATION OF PHYTOCHEMICALS

Alkaloid was determined using the method outlined by Maxwell et al. (1995). (1995). (1995). Saponin was determined spectrophotometrically using the procedure given by Makkar and Becker (1996). (1996). (1996). The method of Trease and Evans (1983) was applied for the determination of flavonoids, anthraquinones, and polyphenols. The technique of Bohn and Kocapai-Abyazan (1994) was applied for the determination of tannin.

RESULT & DISCUSSION

Table 1: Percentage the four varieties of cultivated Capsicum species after extraction

1. Varieties	Ethanolic extracts	Aqueous extracts
2. C. annuum var. abbreviatum	12.25	25.60
3. C. annuum var. acuminatum	12.40	30.09
4. C. annuum var. grossum	12.25	28.24
5. C. frutescens var. baccatum	15.12	24.20

Table 2: Total phenol, flavonoid, and proanthocyanidins contents in the varieties of the cultivated *Capsicum* species.

Phytochemicals	Phenol (mg GAE/g DW)		Flavonoid (mg QE/g DW)		Proanthocyanidins (mg CE/g DW)	
Samples	Ethanol	Aqueous	Ethanol	Aqueous	Ethanol	Aqueous
C. annuum var. abbreviatum	235.99±7.94^{b}	70.81±1.10^{b}	1602.46±52.60^{a}	372.93±7.20^{b}	619.76±6.20^{b}	444.91±2.14^{a}
C. annuum var. acuminatum	202.10±09.93^{c}	74.22±3.54^{b}	1223.21±99.64^{b}	386.25±14.23^{b}	629.38±11.37^{b}	431.69±8.09^{a}
C. annuum var. grossum	270.47±9.38^{a}	58.66±1.63^{c}	1630.24±86.26^{a}	317.22±4.17^{c}	709.79± 5.20a	431.10±13.70^{a}
C. frutescens var. baccatum	220.11±7.27^{b}	90.16±3.98^{a}	867.312±53.14^{c}	543.06±7.19^{a}	616.87±12.14^{b}	444.30±12.92^{a}

Values are mean ± SD. Samples within a column having different letters are significantly different at ($p<0.05$)

The % ethanolic and aqueous yields of each varietyafter extraction are reported in Table 1. Among the cultivars, the aqueous extracts showed better percentage yield in compar- ison with the ethanolic extracts.

Phytochemicals. Phytochemical analysis indicated that phenol, flavonoid, and proanthocyanidins were found in the extracts of the four varieties of the farmed Capsicum species investigated and the mean values of their phytochemical contents for both ethanolic and aqueous extracts are pre- sented in Table 2. Generally, the varieties under research demonstrated greater phytochemical components in ethanolic extracts com- pared to those of aqueous extracts (Table 2). (Table 2). The TP content for ethanolic extracts varied from 202.10 ±09.93mg GAE/g DW in C. annuum var. acuminatum to 270.47± 9.38mg GAE/g DW in C. annuum var. grossum. TP concentration in C. annuum var. grossum was substantially greater than those of other three varieties ($p< 0.05$) (Table 1). (Table 1). Similarly, TP concentrations in C. annuum var. abbreviatum and C. frutescens var. baccatum revealed no significant difference but were much greater than C. annuum var. acuminatum. Among the four kinds of pepper, TP content for aqueous extract was greatest in C. frutescens var. baccatum showing 90.16±3.98 mg GAE/g DW and was lowest in C. annuum var. grossum showing 58.66±\s1.63 mg GAE/g DW (Table 2). (Table 2).

As indicated in Table 2, total flavonoid (TF) levels of both ethanolic and aqueous extracts vary across the pepper cultivars although not all of them differed considerably. The greatest and lowest TF contents of ethanolic extracts were found for \sC. annuum var. grossum (1630.53± 86.96mg QE/g DW) and \sC. frutescens var. baccatum (867.241± 53.87mg QE/g DW), respectively. Nevertheless, C. annuum var. grossum revealed no significant difference with C. annuum var. abbreviatum in their TF contents of ethanolic extracts but were considerably different from C. annuum var.acuminatum and C. feutences var. baccatum (Table 2). (Table 2). In the aqueous extracts,highest flavonoid concentration was resorded for C feutescens car. Baccatum whilethe least was observed for C. annuum car. Grossum.

(Table 2).

Proanthocyanidins (total condensed tannin TCT) con- tents revealed no significant difference ($p>0.05$) in all the ethanolic extracts of all pepper cultivars except in C. annuum var. grossum. The maximum ethanolic extract of TCT content was observed for C. annuum var. grossum (709.79± 5.20mg CE/g DW) whereas C. frutescens var. baccatum yielded the lowest TCT contents (616.87±12.14mg CE/g DW). Similarly, TCT contents in all the aqueous extracts of the four pepper varieties showed no significant difference (Table 2). (Table 2).

CONCLUSION

In order to effectively conserve, manage, and create improved cultivars of plants with bioactive compounds for various pharmacological uses, it is crucial for agriculture to assess levels of genetic variation that help in the proper delineation of plant species. In some plant species, classification has been aided by determining the degree of variation in the bioactive chemicals present in plants. This variety's comparison to the others and confirmation that all types descended from the same person. In the ongoing effort to more accurately identify and categorize the variations and species of Capsicum in India, additional comparative investigation, evaluation of phyto-chemical content, and antioxidant properties have proven to be helpful. The dendrogram produced by the multivariate analysis clearly distinguished between the varieties of C. annuum and C. frutescens var. baccatum. This supports the idea that C. frutescens and C. *Annuum* are different species. The genetic similarity between C. frutescens var. baccatum and C. annuum var. abbreviatum implies that these two types of *Capsicum Annuum* are clearly genetically distinct from one another. There is evidence in favor of the hypothesis that C. frutescens and C. *Annuum* are different species. However, compared to the other types, C. frutescens var. baccatum and var. abbreviatum showed stronger affinity. In our earlier research on the morphological characterization of these species, similar results from cluster analysis were seen [41]. logical choice of these genotypes.

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