

TAXONOMIC EVALUATION OF SOME PROXIMATE AND PHYTOCHEMICAL COMPOSITION IN SIX MONOCOT SPECIES

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ABSTRACT

Quantitative analyses of proximate and phytochemical contents of *Allium cepa* L., *Aloe sinkatana* Reynolds, *Asparagus densiflorus* (Kunth) Jessop, *Pancreatium tortuosum* Herbert. , *Kniphofia nubigena* Mildr., and *Urginea maritima* (L.) Baker were carried out thus determining the moisture content, carbohydrates, proteins, lipid content, crude fibres, ash content, total pectic substances, tannins and anthocyanins. Data were subjected to statistical cluster analysis. The dendrogram which resulted from this analysis showed that the six species are grouped into four clusters: *Allium cepa*, *Urginea maritima* and *Pancreatium tortuosum* are the most similar and joined to form the first cluster, followed by *Aloe sinkatana*, *Kniphofia nubigena* and *Asparagus densiflorus* which are sequentially added to the first cluster according to their similarity level indicated by the distance of the clusters. Compared to the recent classification systems, this dendrogram agrees only with the classification at the order level.

Keywords: Proximate, phytochemical composition, cluster analysis, Monocots
Taxonomy

INTRODUCTION

Many chemical compounds whether primary or secondary metabolites were reported to be utilized for taxonomic considerations of monocots. For example, Cronquist, (1981) reported that the storage organs of some genera of the family Liliaceae are starch- rich while the storage organs of all members of Aloaceae are starch -free. Kubitzki, (1998) stated that leaves and bulbs of Amaryllidaceae members are rich in polysaccharides and that fructans are the major carbohydrates which characterize the members of the family Hyacinthaceae. Takhtajan, (2009) reported that the absence of the starch in the bulbs of *Allium cepa* is a taxonomic character.

Torras-Claveria *et al.* (2010) studied the distribution of the main metabolite groups in different organs of *Pancreatium canariense*. They reported higher contents of carbohydrates for bulbs compared to leaves and fruits while higher alkaloids and sterols for leaves.

The aim of this study was to evaluate the taxonomic significance of the chemical variations of six monocot species with emphasis on main metabolites.

MATERIALS AND METHODS

Materials:

Leaves, roots of *Allium cepa* L., *Aloe sinkatana* Reynolds, *Asparagus densiflorus* (Kunth) Jessop, *Pancratium tortuosum* Herbert, *Kniphofia nubigena* Mildr and *Urginea maritima* (L.) Baker and bulbs of *Allium cepa*, *Pancratium tortuosum* and *Urginea maritima* were collected from Erkwit area in north-eastern Sudan.

Methods:

The proximate and phytochemical composition of the leaves, roots and bulbs of *Allium cepa*, *Pancratium tortuosum* and *Urginea maritima* and those of leaves and roots of *Aloe sinkatana*, *Kniphofia nubigena* and *Asparagus densiflorus* were analyzed. Moisture content and ash content of each sample were determined according to the methods described by Standard Official Methods of Analysis (A.O.A.C, 1984). Analysis of total sugars, starch, crude fiber and anthocynins contents were conducted following the methods described by Mazumder and Majumder (2003). Protein and lipid contents were determined by the method described by (Plummer 1978). Total pectic substances were determined according to Barbier and Thibault (1982) , and the method described by Berthal *et al.* (1999) was used to determine the tannins contents. Cluster of Average linkage between groups was done according to Sokal and Sneath (1963) using the statistical package SPSS.

RESULTS AND DISCUSSION

Many similarities and differences were observed between the present studied species comparing the results of their proximate and phytochemical composition analyzed for leaves, roots and bulbs (Table1).

Applying these chemical data to cluster analysis, particularly average linkage between groups (which lists all of the samples and indicates at which level of similarity were joined (Sokal and Sneath, 1963) resulted in four clusters. *Allium cepa*, *Urginea maritima* and *Pancratium tortuosum* are the most similar and joined to form the first cluster, followed by *Aloe sinkatana*, *Kniphofia nubigena* and *Asparagus densiflorus* which are sequentially added to the first cluster according to their similarity level indicated by the distance of the clusters (Figure1).

Compared to the recent classification systems, the dendrogram agrees only with the classification at the order level of Takhtajan (1997, 2009). Takhtajan (1997) placed *Allium* , *Pancratium* and *Urginea* (the first cluster) together in different families: *Alliaceae*, *Amaryllidaceae* and *Hyacinthaceae* of the same order Amaryllidales . Later, when revised his classification Takhtajan (2009) added *Aloe* and *Kniphofia* to the order Amaryllidales leaving *Asparagus* in the Asparagales.

Table 1: Proximate and phytochemical composition of the leaves, roots and bulbs of *Allium cepa*, *Pancratium tortuosum* and *Urginea maritima*

Test	<i>Allium cepa</i>			<i>Pancratium tortuosum</i>			<i>Urginea maritima</i>		
	Leaves	Roots	Bulbs	Leaves	Roots	Bulbs	Leaves	Roots	Bulbs
M. C. % ontent% %	20.0	20.55	20.0	20.0	17.75	20.0	40.0	30.15	80.0
T.S. mg /g	54.60	12.80	3.20	57.4	46.08	7.36	30.10	17.28	39.04
Starch mg /g	0.16	1.22	1.54	0.06	0.64	0.29	0.21	1.78	0.32
Proteins mg /g	0.30	0.12	0.34	0.36	0.13	0.10	0.32	0.14	0.32
Lipid content% % % % % % %	2.86	2.69	3.41	3.28	2.76	1.18	3.13	1.88	2.49
Crude fibres %	6.40	9.25	5.30	2.0	2.20	6.50	29.1	33.45	15.60
Ash content %	20.0	22.20	40.0	20.0	10.60	40.0	40.0	8.45	60.0
P. substances% % % % % % %5% % % % % % %	8.54	11.29	9.52	34.70	5.87	7.92	38.70	25.56	83.04
Taninns mg /g	115.82	7.43	34.82	166.69	21.13	0.78	138.91	32.09	32.09
Anth. mg /100g /1oog mmmmmmgm gmg	2.63	8.76	10.78	4.68	4.96	4.96	7.29	8.77	8.78

M.C.= Moisture content, T.S.=Total sugars, P.= pectic substances, Anth.=Anthocyanins

Continue table1

Test	<i>Aloe sinkatana</i>		<i>Kniphofia nubigena</i>		<i>Asparagus densiflorus</i>	
	Leaves	Roots	Leaves	Roots	Leaves	Roots
Moisture content %	40.0	7.55	80.0	22.1	11.78	19.1
Total sugars mg /g	37.8	43.84	21.0	32.64	39.04	8.0
Starch mg /g	0.03	1.24	0.04	0.60	0.04	0.60
Proteins mg /g	0.20	0.20	0.21	0.17	0.21	0.17
Lipid content %	2.88	2.08	2.74	2.70	3.26	0.67
Crude fibres %	22.20	8.40	4.40	18.45	24.5	82.5
Ash content %	20.0	15.85	40.0	7.40	15.04	5.05
Pectic substances %	34.70	7.88	23.10	16.43	2.19	6.17
Taninns mg /g	51.26	25.43	127.17	99.39	7.43	16.04
Anthocyanins mg/100g	3.60	1.10	3.12%	12.31	7.34%	91.91

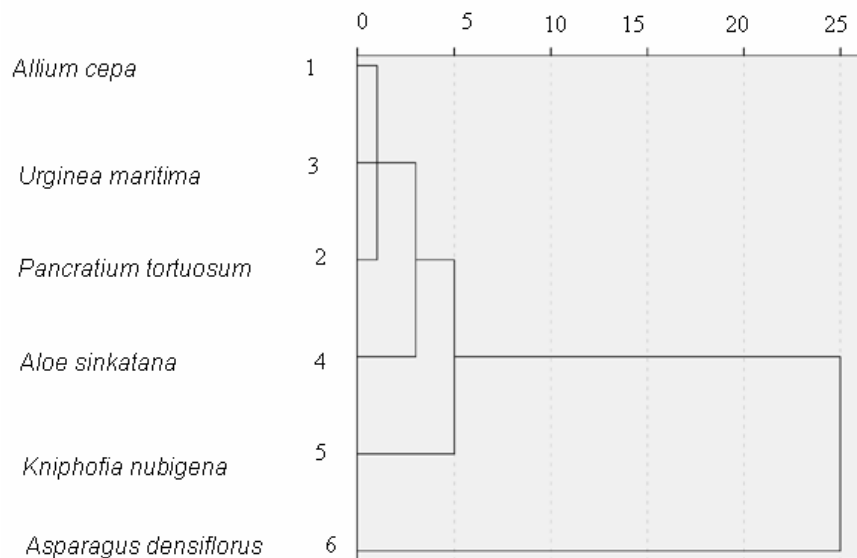


Figure1: Cluster dendrogram for the studied species using average linkage between groups

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التقييم التصنيفي لبعض المحتويات الكمية في ستة نباتات من ذوات الفلقة الواحدة
اكرام مدني ، ميرغني عبد الرحمن وصفي و فاطمة المبارك
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تم اجراء التحليل الكمي لتحديد محتوى الرطوبة والكاربوهيدرات و البروتينات والنشا والمحتوى الدهني والألياف الخام ومحتوى الرماد والمواد البكتينية والتانينات والأنثوسيانينات لستة نباتات هي:

Allium cepa L., *Aloe sinkatana* Reynolds, *Asparagus densiflorus* (Kunth) Jessop, *Pancreatium tortuosum* Herbert. , *Kniphofia nubigena* Mildr., and *Urginea maritima* (L.) Baker.

تم تحويل المعلومات للتحليل الاحصائي للمجموعات. أظهر الديندروجرام الناتج من هذا التحليل أن الأنواع الستة تم تجميعها في اربع مجموعات:-

المجموعة الأولى الأكثر تشابها وهي: *Allium cepa*, *Urginea maritima* and *Pancreatium tortuosum*

تتبعها *Aloe sinkatana*, *Kniphofia nubigena* and *Asparagus densiflorus* والتي أضيفت بالترتيب المتسلسل الى المجموعة الأولى اعتمادا على المستوى التشابهي المشار اليه بالمسافة بين المجموعات. مقارنة بالنظم التصنيفية الحديثة هذا الديندروجرام يتفق مع تصنيفها على مستوى الرتبة.

قام بتحكيم البحث

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