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Phytochemical Screening of some Wild Plants from Wadi Yalmlam, Saudi Arabia

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Abstract*: Wadi Yalmlam is one of the important Wadies in Saudi Arabia with annual rainfall of 200 millimeter. Plants are mainly contained water and many essential organic nutrients. Twenty plant species belonging to fifteen families from Wadi Yalmlam in Saudi Arabia were investigated for their phytochemical constituents. Flavonoids, tannins, saponinns and resin were detected in different plants following different protocols. Tannins was found in 15 species and was the most common distributed compound in most plants. Flavonoids and saponins were detected in 13 different taxa. Finally, Resin was present in three species only. In conclusion, plants contained many different substances that can be used in medicine to treat many human and plant diseases.*

Keywords: *Saudi Arabia, Wadi Yalmlam, flavonoids, tannins, saponins, resin, phytochemical constituents.*

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I. Introduction

The components of the flora of Saudi Arabia are a vigorous for numerous ecosystems and play a key role in maintaining the region's environmental sustainability. In addition to their role in protecting watersheds, stabilizing slope and improving soils, plants are rich in chemical constituents and are used in herbal and folk medicine to treat many bacterial and fugal pathogens (Aly and Bafiel, 2008, 2010). The more we know about the chemistry of plants, the better way to consume plants we will have. Phenolics compounds are derived from secondary plant metabolism of the shikimic acid pathway, malic acid pathway or both. They are also the most widely distributed class of secondary metabolites in plants. Flavonoids and tannins are phenolics compounds, and they are of beneficial for human health. Flavonoids possessing 15 carbon atoms in two benzene rings that joined by a linear three carbon chain. They are recognized as flower pigments in most angiosperm families. However, their occurrence is not restricted to flowers but include all parts of the plant. They are considered as antioxidant (Pietta, 2000).

Tannins are astringent polyphenols and this is why it is used in tanning leather. When accompanied with ferric chloride, tannins produce different colors (blue, blue black, or green to greenish-black) according to the type of tannin. Moreover, tannins have antiseptic and antibacterial affects (Anderson *et al.,* 2012).

Saponins are high molecular weight glycosides in which sugars are linked to titerpene or steroidal aglycon. They have many and different biological effects. This include some favorable and harmful effects on human health, pesticidal, insecticidal, molluscicidal and fungicidal activity, acrimony and sweetness and other industrial applications (Sun *et al*., 2009; Hassan *et al*., 2012; Takahashi *et al*., 2010; Dawid and Hofmann 2012; De Geyter *et al*., 2012; Kumar *et al*., 2013). The pharmacological activities have been revised comprehensively by Lacaille-Dubois and Wagner 2000; Francis *et al.,* 2002; Sparg *et al*., 2004; Hostettmann and Marston 2005 and Augustin *et al*., 2011. In Saudi Arabia, Wadi Yalmlam is one of the most important Wadies with annual rainfall of 200 millimeter. This study aimed to investigate some wild plants collected from the Wadi for their chemical components. This will help to get the attention to the importance of these plants for the purpose of preserving the floristic composition of the Wadi.

II. Material And Methods

2.1 Study Area

Wadi Yalamlam basin is situated about 125 km southeast of Jeddah city, west of Saudi Arabia. It is confined by latitudes 20° 26′ : 21° 8′N and longitudes 39° 45′: 40° 29′E . The basin margin of the low land of the Wadi is expanded to include nearly all the flat area in the downstream. Wadi Yalamlam basin starts from high altitude of Hijaz escarpment to end in the red sea shore.

Sample collection:

Plant samples were collected from Wadi Yalmlam between March 2014 and February 2015. Plants were taxonomically identified by authors comparing to Flora books, assigned to protluges and holotype specimens as possible. Herbarium specimens were given voucher numbers and preserved in KAAU herbarium.

Extract preparation:

Plants (leaves and stem) were left air dried, grounded to powder and kept for investigation. Plant powdered was separated into two sections for different extraction solvents: water and alcohol (methanol). Then, experiments were done as following:

Test for Tannins

Two grams of the water extract was boiled with 5 ml of 45% methanol for 5 min. The mixture was cooled and filtered. The filtrate was subjected to the following tests:

(1) Lead sub-acetate test: three drops of the lead sub-acetate solution were added to 1 ml of the filtrate solvent. The presence of tannins was recorded when a cream gelatinous precipitate formed.

(2) Ferric chloride test: one milliliter of the filtrate solution was diluted with distilled water and then two drops of ferric chloride were added. Detection of tannins was recorded when a temporary greenish to black color present.

Test for Saponins

About three milliliter of aqueous extract was strongly shaken with a like volume of distilled water in a test tube. Then the mixture was warmed. The presence of Saponins was indicated by the formation of stable foam.

Test for Flavonoids

The alcoholic extract (1 g of plant material was added to 5 ml methanol alcohol). One milliliter of 10% lead acetate solution was added to about three milliliter of the methanolic extract. The detection of flavonoids was recorded when a yellow precipitate was formed.

Test for resins

An amount of 0.2 g of the extract was treated with15 ml of 96% ethanol. Then, twenty milliliter of distilled water was added to the alcoholic extract. The presence of resins was recorded when a precipitate occurred.

III. Results & Discussion

In this study, the collected plats were identified and screened for the presence of some phytochemical agents. Table 1 showed that sixteen plants had tannins, thirteen had saponins and flavonoids and three plants only had resin. Therefore, tannins were the most common compound present in all investigated plants except *Vachellia tortilis*, *Cynodon dactylon***,** *Penniseum divisum* and *Tamarix senegalensis*, while the least common distributed compound was resin. Resin was detected only in three plants, *Euphorbia prostrata*, *Cocculus penulus* and *Tamarix senegalensis*. All the four group of chemical compounds were found together only in one plant which is *Abutilon bidentatum*. None of the chemical compound groups were detected in two taxa, *Cynodon dacylon* and *Pennisetum divisum.* The presence of all the three groups in *Aerva javanica* is in agreement with the result from a study carried by Kumar *et al*. (2013) but their study was on *Aerva lanata* not on *Aerva javanica*. Therefore, we can say that there is no previous record about the detection of tannins, saponins and flavonoids in *Aerva javanica.*

In conclusion, there is no previous record of the presence of tannins, flavonoids and saponins in most of the plants under investigation; so, it is the first time that these chemical groups are detected in most of these species. Moreover, the floristic composition of Wadi Yalmlam is rich in beneficial chemical compound that have antioxidant effect such as flavonoids and tannins.

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Table 1. Chemical compounds in the investigated plants which were collected from Wadi Yalmlam.

Family	Plant Species	Tannins	Saponins	Flavonoids	Resins
Amaranthaceae	*Aerva javanica* (Burm. f.) Juss. ex Schul	+	+	+	-
Caryophyllaceae	*Spergula fallax* (Lowe) E.H.L.Krause	+	+	-	-
Cleomaceae	*Cleome hanburyana* Penzig	+	-	+	-
Cucurbitaceae	*Kedrostis gijef* (Forssk. ex J.F.Gmel.) C. Jeffrey	+	+	+	-
Euphorbiaceae	*Chrozophorao blongifolia* (Delile) A. Juss. ex Spreng.	+	+	-	-
	Euphorbia prostrate Ait.	+	+	-	-
Fabaceae	*Indigofera hochstetteri* Baker.	+	+	-	+
	Senna obtusifolia (L.) H.S.Irwin & Barneby	+	+	+	-
	Vachellia tortilis (Forssk.) Hayne subsp. *tortilis*	-	-	+	-
Malvaceae	*Abutilon bidentatum* Hochst ex. A. Rich.	+	+	+	-
Menispermaceae	*Cocculus pendulus* (J.R. & G. Forst.) Diels	+	+	+	+
Nyctaginaceae	*Boerhavia diffusa* L.	+	+	+	-
Poaceae	*Cenchrus biflorus* Roxb.	+	-	+	-
	Cynodon dactylon (L.) Pers.	-	-	-	-
	Pennisetum divisum (J.F. Gmel.) Henrard.	-	-	-	-
	Stipa capensis Thunb.	+	+	+	-
Solanaceae	*Datura stramonium* L.	+	-	+	-
Tamaricaceae	*Tamarix senegalensis* DC.	-	-	-	+
Tiliaceae	*Corchoru sdepressus* (L.) Stocks.	+	+	+	-
Zygophyllaceae	*Tribulus bimucronatus* Viv.	+	+	+	-

+: The compound is present - : The compound is absent

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