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Phytochemical constituents of some important medicinal plants from Dachigam National Park, Srinagar, Jammu and Kashmir

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Abstract
Alkaloids, tannins, saponins, steroid, terpenoid, flavonoids, phlobatannin and cardic glycoside distribution in twenty-five medicinal plants belonging to twenty-three families have been assessed and compared. Some of the important medicinal plants investigated were *Aconitum heterophyllum, Arnebia benthamii, Bergenia ciliata, Dactylorhiza hatagirea, Dioscorea deltoidea, Inula racemosa, Nardostachys jatamansi* and *Saussurea costus*. The significance of the plants in traditional medicine and importance with respect to chemical constituents have been discussed.

Keywords: Phytochemical, medicinal plants, dachigam national park, jammu and kashmir

Introduction
Medicinal plants are of great importance to the health of individuals and communities. The medicinal value of these plants lies in some chemical substances that produce a define physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds (Hill, 1952) [12]. Many of these indigenous medicinal plants are used as spices and food plants (Okwu, 1999, 2001) [18, 19]. *Aconitum heterophyllum, Arnebia benthamii, Bergenia ciliata, Dactylorhiza hatagirea, Dioscorea deltoidea, Inula racemosa, Nardostachys jatamansi* and *Saussurea costus* are extensively used in herbal medicine in India. This study investigates the fundamental scientific bases for the use of some Indian medicinal plants by defining and quantifying the percentage of crude phytochemical constituents present in these plants.

Study area
Dachigam National Park located amidst the Western Himalayas is rich in biodiversity. It covers an area of 141 Sq/kms., is located 22 kms from the city Srinagar (J&K) varying in altitude 1700 to 4300 meters above sea level. Due to this variation Dachigam National Park is clearly demarcated into an upper and lower region. The Park has been protected area since 1910 first under the care of Maharaja of Jammu and Kashmir and later under the observation of the concerned Govt. Authorities. It was initially created to ensure clean drinking water supply to the city Srinagar. It was finally upgraded and declared as National Park in the year 1981. Dachigam National Park is flourished with diverse species of medicinal flora which are very important for their medicinal value. Ethno botanically, the area remains unexplored and very less comprehensive account of local tradition is available. In view of this fact, the work was carried out in Dachigam National Parkto provide a comprehensive account of folklore medicinal plants with their phytochemical constituents. The studies on phytochemical constituents of the medicinal plants in the National Park will be quite useful since the same will generate a database for further research.

Methodology
Methodologies adopted for carrying out investigations on the status assessment, resource use pattern and indigenous uses of the medicinally important forest resources of the area and the analysis of the information are given below:

Assessment of Resource Utilization Pattern
Theed, Mulnar, Shaltang, Dara, Dardekhowar, Taanch Mohalla and Gandtal the representative villages located on the boundaries of Dachigam National Park and having complete

dependence on it, were selected to generate information on Resource Utilization Pattern of the inhabitants and other relevant parameters. Information pertaining to the traditional knowledge, local uses of the plantsand curative properties were recorded through intensive interviews and discussions with the elderly people, herbal healers, local *hakim* and rural women of the area and the same have been documented and are depicted in the results. Local *hakim* and knowledgeable persons from each village were also hired while surveying and collecting the useful plant species from the natural habitats.

Fresh samples of the useful species were collected and identified with the help of local and regional floras. Information on the mode of utilization of medicinal plants was also collected.

The indigenous uses mostly based on the surveys, had also been updated with the help of available information (Jain, 1991; Samant & Palni 2000; Samant *et al.*, 2001b, 2007a&b) [24, 26, 27, 28]. Some of the species of medicinal plants those are not used by the inhabitants but their uses as medicine known from other parts of the State and Indian Himalayan Region have also been included under medicinal plants. The information was compiled and analysed for the utilization pattern following Samant *et al*., (2002a, 2006a).

Results

Total 25 medicinally important plant species belonging to 23 families and 25 genera were recorded and their phytochemical constituents and medicinal properties have been mentioned in the Table-1.

Table 1: Phytochemical constituents of some important medicinal plants from Dachigam National Park

S. No.	Taxa	Family	Phytochemical constituents	Properties/Uses
1.	*Aconitum heterophyllum* Wall. ex Royle	Ranunculaceae	Atisine (0.4%). heteratisine (0.3%), histine, heterophyllisine, heterophylline, heterophyllidine, atidine, histidine, Aconitic acid, tannic acid, palmitic, stearic glycerides (Paramanick *et al.*2017) [20].	Expectorant, febrifuge, anthelmintic, anti-cancerous, anti-diarrhoeal, anti-emetic, and anti-inflammatory properties.
2.	*Allium humile* Kunth.	Alliaceae	Tannins, polyphenols, flavonoids, alkaloids, steroids and saponins (Agarwal *et al.* 2010) [2]	Anti-analgesic, antioxidant, anti-inflammatory, anti-microbial, anti-diabetic and anti-asthmatic properties.
3.	*Arnebia benthamii* (Wallich ex D.Don) I. M. Johnston.	Boraginaceae	Shikonin, Arnebin1, Arnebin 3, deoxyshikonin, acetyleshikonin, and β-hydroxy-sovalerylshikonin and napthoquinones, arnebinone, stigmasterol, arnebin-7 (Nowsheen *et al*. 2015) [17]	Stimulant, tonic, diuretic, expectorant and anti-cancerous, anti-HIV properties.
4.	*Artemisia absinthium* Linn.	Asteraceae	Absinthin, absintholide, matricin beta-santonin and ketopepenolid-A, chlorogenic, caffeic, syringic, coumaric, salicylic, zanillic acids; flavonoids including quercetin, rutin and glycosides (Canadanovic-Brunet *et al* 2005) [7]	Antiseptic and febrifuge
5.	*Bergenia ciliata* (Haw.) Sternb.	Saxifragaceae	Tannic acid, gallic acid, glucose, mucilage, wax, metarbin, albumen and mineral Salt, Bergenin, Catechin, Gallicin and Gallic acid (Ruby *et al*, 2012) [23].	Astringent, tonic, anti-inflammatory and anti-diuretic properties.
6.	*Colchicum luteum* Baker.	Colchicaceae	Colchicine, Colchicoside, N-deacetyl-N-formyl-colchicine, (Barceloux, 2008) [4].	Anti-inflammatory and diuretic properties.
7.	*Dactylorhiza hatagirea* (D.Don).	Orchidaceae	Dactylorhin, ascorbic acid, butanedioic acid and dactyloses (Haruhisa *et al*, 1999) [11].	Dysentery, diarrhoea, chronic fever, cough, stomachache, wounds, cuts, burns, fractures, to increase male fertility and virility.
8.	*Dioscorea deltoidea W*all. ex Griseb.	Dioscoreaceae	Diosgenin, Stigmasterol, Sapogenins (Dangwal and Chauhan, 2015) [9].	Diosgenin is used in the contraceptive pills.
9.	*Geranium pratense* L.	Geraniaceae	Citronellol 33.6%, geraniol 26.8%, linalool 10.5%, citronellylformate (9.7%) and p-menthone 6.0% (Rana *et al.*, 2002) [21].	Antithrombotic, anti-inflammatory, antiviral, antiallergic, antiproliferative, anticancer and immunostimulant properties.
10.	*Heracleum candicans* Wall. ex DC.	Apiaceae	Alkyl coumarins, candinol A, isophellodenol C and spirobifuranocoumarins, candibirins and trifuranocoumarins, canditririns A and B (Nakamori *et al.*, 2008). Furanocoumarins (Rawat *et al*., 2013).	Aphrodisiac and nerve tonic
11.	*Hyoscyamus niger* L.	Solanaceae	Hyoscyamine and hyoscine, traces of atropine and scopolamine (Kaul, 1997).	Sedative, narcotic, anodyne, antiseptic, spasmodic and anti-diabetic.
12.	*Hypericum Perforatum* L.	Hypericaceae	Hypericin, pseudohypericin, hyperforin, hyperoside, rutin, quercetin and biapigenin, D-Mannitol, (Barnes *et al.*, 2001, Ma *et al.*, 2012) [5].	Anti-bacterial, anti-viral, anti-depressant.

13.	*Inula racemosa* Hook. F.	Asteraceae	β-sitosterol, daucosterol and isoalantolactone (Tan *et al.*, 1998) [30].	Anti-bacterial, antifungal, inflammatory, immuno-medulatory properties.
14.	*Iris Kashmiriana* Baker.	Iridaceae	Glycosides, flavonoids, isoflavonoids, and tannins (Wani *et al.*, 2012) [33].	Anti-inflammatory, antiviral, antiallergic, antiproliferative.
15.	*Juniperus communis* L.	Cupressaceae	α-pinene, sabinene, terpinene 4-ol, γ-terpinene, (Z, Z)-farnesol and manoyl oxide, δ-3-carene, αpinene, sabinene and terpinene.	Antifertility, hypoglycemic, anidiabetic, diuretic, antiseptic, carminative, stomachic and antirheumatic properties.
16.	*Meconopsis aculeata* Royle.	Papaveraceae	Terpenoids, phlobatannins, flavonoids, alkaloids. cardiac glycosides, phenols, carbohydrates, phytosterols (Mudasar, 2016) [16].	Anti-inflammatory, narcotic, cooling potency, analgesic and febrifuge.
17.	*Mentha arvensis* L	Lamiaceae	Menthol, menthone, isomenthone, neomenthol, limonene, methylacetate, piperitone, beta-caryophyllene, alpha- pinene,beta- pinene, tannins and flavonoids (Rokosz *et al*., 2015)	Antibacterial and anti-spasmodic
18.	*Nardostachys jatamansi* DC	Valerianaceae	Sesquiterpene, lignans, neo-lignans, caumarins, terpenoid ester nardostachysin. (Chatterjee *et al.*, 2005) [8]	Hepatoprotective, antispasmodic, abnormal heart palpitations, constipation, to regulate urination, menstruation, digestion.
19.	*Picrorhiza kurroa* Royle ex Benth.	Scrophulariaceae	Iridoid glycosides and cucurbitacins (triterpenoids) (Rathee *et al*., 2012) [33].	Anti-microbial, hepatoprotective, antioxidant, anti-bacterial, anti-mutagenic and anti-cancer properties.
20.	*Podophyllum hexandrum* Royle.	Podophyllaceae	Podophyllotoxin, 4'-demethyl podophyllotoxin and podophyllotoxin 4-O-glucoside, epipodophyllotoxin, lignins and flavonoids (Broomhead and Dewick, 1990; Tyler *et al*, 1988) [6, 32].	Antiseptic, stimulant, stomachic and carminative; tumour-necrotizing properties.
21.	*Polygonatum verticillatum* L.	Liliaceae	Diosgenin, saponins, alkaloids, phenols, flavonoids, tannins (Khan *et al*, 2013) [15].	Adaptogenic, antioxidant, cardiotonic, demulcent, diuretic, energizer, hypoglycemic, tonics, antibacterial and antifungal properties.
22.	*Prunella vulgaris* L.	Lamiaceae	Betulinic-acid, D-camphor, delphinidin, hyperoside, manganese, oleanolic-acid, rosmarinic-acid, rutin, ursolicacid (Jackson, 2006) [13].	Antibacterial, antipyretic, antiseptic, antispasmodic, astringent, carminative and diuretic properties.
23.	*Rheum webbianum* Royle.	Polygonaceae	Anthraquinone,crysophanic acid or crysophan, emodin, Stilbene glycosides, rheo-tannic-acid (tannin), resins, albuminoid, mucilage, tannic and gallic acids, sugars, starch, pectin, lignin, (Tayade *et al.* 2012) [31]	Astringent, purgative and anti-carcinogenic properties.
24.	*Saussurea costus* C.B. Clarke	Asteraceae	Relappadilactone, lactone cynaropicrin, dehydrocostus, germacra-1(10),4,11 (13)-trien-12-oic acid (Amara *et al*, 2017) [1]	Anti-inflammatory, anti-spasmodic, rheumatoid arthritis, asthma and bronchitis.
25.	*Swertia petiolata* Royle.	Gentianaceae	Steroids, tannins, phenolics, saponins, alkaloids, flavonoids and glycosides (Bader, 2014) [3].	Febrifuge, anthelmintic, antimalarial and antidiarrheal.

Discussion

The phytochemical screening and quantitative estimation of the percentage crude yields of chemical constituents of the plants studied showed that the leaves and barks were rich in alkaloids, flavonoids, tannins and saponins. They were known to show medicinal activity as well as physiological activity (Sofowara, 1993) [29]. Steroids and phlobatannins were found to be present in all the plants. It has been found that some of these investigated plants contained steroidal compounds. It should be noted that steroidal compounds are of importance and interest in pharmacy due to their relationship with such compounds as sex hormones (Okwu, 2001) [19]. Both *S. acuta*, *A. marmelos* possessed very high levels of alkaloids and flavonoids and are employed in medicinal uses. They are also widely employed as livestock and poultry feed (Egunjobi, 1969) [10]. The plants studied here can be seen as a potential source of useful drugs. Further studies are going on these plants in order to isolate, identify, characterize and elucidate the structure of the bioactive compounds. The antimicrobial activities of these plants for the treatments of the diseases as claimed by traditional healers are also being investigated.

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