



Asian Journal of Plant Sciences

ISSN 1682-3974

science
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Hypericin in Some *Hypericum* Species from Turkey

¹Ali Kemal Ayan, ²Cüneyt Çırak, ²Kudret Kevseroğlu and ³Tevfik Özen

¹The High School of Profession of Bafra,

²Department of Agronomy, Faculty of Agriculture, ³Department of Chemistry, Faculty of Science and Art, University of Ondokuz Mayıs, Kurupelit, Samsun, Turkey

Abstract: Some *Hypericum* species from Turkey were investigated for presence of hypericin and it was found in 12 of the 18 evaluated species. Hypericin is reported by us in 4 species for the first time. Most of the species contained hypericin and its total content varied widely from 0.003% in *H. venustum* to 0.303% in *H. perforatum*. The presence of hypericin in *Hypericum* species has an important pharmacological value for their medicinal evaluation and taxonomic value for infrageneric classification of the genus.

Key words: *Hypericum* species, hypericin, Turkey

INTRODUCTION

The species belonging to *Hypericum* genus have been used as traditional medicinal plants due to their wound-healing^[1], bactericide^[2], anti-inflammatory^[3]. Diuretic and sedative properties^[4] for last two hundred years. Today especially *Hypericum perforatum*, also known as St. John's worth and native to relatively dry temperature zones of Europe and North America, is one of plants used in drug production industry the most intensively^[5]. This plant contains a number of biologically active secondary metabolites belonging to at least ten different classes^[6]. In the clinical studies, anti-tumour^[7,8] and anti-cancer^[9-11] properties of *Hypericum perforatum* were determined. Especially using of this unique plant as an antidepressant is very popular^[12].

Now a days, there has been an increasing tendency in using of plant-originated raw matters in medicinal treatment due to some reasons such as synthetic products have some adverse effects on human health and are very expensive or plant-originated matters have multifunctional effects in contrast to synthetic products^[13]. Today, about 25% of the drugs prescribed worldwide and 121 active compounds being in current use come from plant. Of the 252 drugs considered as basic and essential by the World Health Organization (WHO), 11% are exclusively of plant origin and a significant numbers are synthetic drugs obtained from natural precursors. It is estimated that 60% of anti-tumor and anti-infectious drugs already on the market or under clinical trial are of natural origin^[14]. The vast majority of these cannot yet be synthesised economically and are still obtained from wild or cultivated plant^[15].

Hypericin, a photoactive dianthone, has a great importance in economical and health care point of view^[16] and is one of the plant-originated raw matters used in medicinal treatments. Total hypericin content of products has been used for standardisation purposes within the botanical industry^[17]. Antidepressant effect of *Hypericum* extracts has been originated from their hypericin contents to a large extent. Recently it was reported that hypericin exhibit antiviral^[18,19] properties. Therefore, it is suggested that *Hypericum* species containing hypericin have a potential in using of Acquired Immuno Deficiency Syndrome (AIDS) treatment^[20]. Also, hypericin has a chemotaxonomically importance for the infrageneric classification of the genus *Hypericum*. That is why, it is the most important constituent *Hypericums* contain.

There are about 300 *Hypericum* living in mild temperature zone of the world but, limited number of them contain hypericin^[21,22]. Turkey is an important center for *Hypericum*. There are 69 *Hypericum* species in Turkey, 24 of which are endemic^[23]. In this study, to investigate the presence of hypericin in some *Hypericum* from Turkey was aimed.

MATERIALS AND METHODS

Plant materials: *Hypericum* plants were collected between August and September, 2003 from five sites Northern Turkey: Rize, Trabzon, Amasya, Samsun and Kastamonu and identified by Dr. Hasan Korkmaz, Department of Biology, University of 19 Mayıs, Samsun-Turkey. All plants were growing wild and no herbarium materials were used. Sampling was randomised from plant crowns that had at least three stems. The top 1/3 of the

crown was harvested between 10:00 AM and 2:00 PM. Conditions on the day of collection were clear and sunny at all sites. Temperatures ranged from 24 to 35 °C. Samples were dissected into tissue parts and dried overnight (or until constant weight) at 65°C, the current temperature used by wildcrafters in USA for industry production^[24].

Determination of hypericin content of samples: Dried and homogenised aerial parts of plants were extracted with chloroform in a sonicator to remove their chlorophyll contents until samples seen colourless and filtered. The dried powder was then extracted with methanol and the filtrate allowed to evaporate in a water bath. This was followed by an addition of chloroform and the mixture was shaken. The supernatants was then discarded and the solid phase, containing hypericin, was dissolved in methanol and filtered. The hypericin content was determined in methanol extracts by a spectrophotometer (Shimadzu UV 3000) at 590 nm^[25]. Three determination were made from each sample and the mean value was calculated.

RESULTS AND DISCUSSION

The 18 examined species represent about 5% of all taxa in the genus. The results from the quantification of hypericin was presented in Table 1 where the species were listed alphabetically.

Hypericin was observed in 12 species and was not detectable in the rest. There is so far no report related to secondary metabolites content of some *Hypericum* evaluated here, *H. aviculariifolium subsp. depilatum* (endemic), *H. heterophyllum*, *H. hyssopifolium subsp. elongatum*, *H. nummularioides*, *H. orientale*, *H. pruinatum* and *H. venustum* and in the present study,

it is the first time we have reported the presence of hypericin in 4 species, *H. aviculariifolium subsp. depilatum*, *H. nummularioides*, *H. pruinatum* and *H. venustum*. The results are in accordance with those of Gerassim and Kitanov^[26] reporting the presence of hypericin in *H. bithynicum*, *H. linarioides*, *H. montanum*, *H. montbretii*, *H. organifolium*, *H. perfoliatum*, *H. perforatum* and absence of hypericin in *H. androsaemum* and *H. bupleuroides*. Similarly, hypericin was reported in *H. hirsutum* by Makovetskaya and Maksjutina^[27] and wasn't reported in *H. scabrum* by Zevakova *et al.*^[28].

The total content of hypericin in the investigated species varies widely from 0.003% in *H. venustum* to 0.303% in *H. perforatum*. The largest amount was found in the species of *H. perforatum* used for hypericin production worldwide commonly in botanical industry. Moderate quantities of this component was established in *H. aviculariifolium subsp. depilatum*, *H. bithynicum* and *H. montbretii* (0.108, 0.174 and 0.224%, respectively). The lowest quantities were observed in *H. venustum* and *H. perfoliatum* with 0.003 and 0.005%.

It should be noted that differences in the content of hypericin in some reinvestigated species were found when the results were compared to those of other authors. These distinctions are due to the different methods used and perhaps to geographical and ecological factors, population variability, using herbarium or fresh plant materials and the phases of plant collection. For examples, Gerassim and Kitanov^[26] have found 0.056% hypericin in flowering plants of *H. perfoliatum*, whereas we observed only 0.005% of this component in the herb of the same plant, collected during the budding period.

Of all *Hypericum*, so far, only a few have been reported to contain hypericin^[29] and although a large number of species have been phytochemically investigated from the other subfamilies of Guttiferae, hypericin has been established only in *Hypericum* species^[26]. Thus, it may be concluded that the occurrence of hypericin in *Hypericum* species has an important pharmacological value for their medicinal evaluation and taxonomic value for infrageneric classification of the genus.

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Table 1: Presence of hypericin and its total content in some *Hypericum* spp.

Species	Presence of hypericin	Content(%) ^b
<i>Hypericum androsaemum</i>	-	
<i>H. aviculariifolium subsp. depilatum</i> ^a	+	0.108
<i>H. bithynicum</i>	+	0.174
<i>H. bupleuroides</i>	-	
<i>H. heterophyllum</i>	-	
<i>H. hirsutum</i>	+	0.024
<i>H. hyssopifolium subsp. elongatum</i>	-	
<i>H. linarioides</i>	+	0.026
<i>H. montanum</i>	+	0.295
<i>H. montbretii</i>	+	0.224
<i>H. nummularioides</i>	+	0.014
<i>H. orientale</i>	-	
<i>H. organifolium</i>	+	0.072
<i>H. perfoliatum</i>	Trace	0.005
<i>H. perforatum</i>	+	0.303
<i>H. pruinatum</i>	+	0.045
<i>H. scabrum</i>	-	
<i>H. venustum</i>	Trace	0.003

^aEndemic; ^bMeans of three determinations

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