

## Biochemical and Eco-physiological Studies on *Hypericum* spp.

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St. John's wort (*Hypericum perforatum* L., Hypericaceae) is among the first medicinal plants that had been scientifically investigated for its antibacterial, spasmolytic, antiseptic, and personal care products in the former Soviet Union. In traditional Russian medicine St. John's wort is considered to be the panacea for many health problems. Preparations are taken internally for winter depression, added in the beverage of the traditional Russian soft drink, "Baikal," and externally for wound healing and other skin care formulations. In Russia, most of the commercial supply of *Hypericum* is known to originate from the wild collections, but a small quantity of *H. perforatum* is also cultivated. However, much of the wild collected St. John's wort for commercial or home use usually constitutes both *H. perforatum* and *H. maculatum*. The objective of this study was to determine the chemical composition (hypericins, tannins, and total extractive matter) of *H. perforatum* and *H. maculatum* populations at different developmental stages.

### METHODOLOGY

The plant material was collected from 1994–1997 according to the methods indicated for the collection of wild medicinal plants (Anon 1962; Hammerman et al. 1983). Sampling was carried out at four different developmental stages: stage 1 = intensive vegetative growth (before flowering), stage 2 = massive flower bud formation, stage 3 = massive flowering, and stage 4 = massive seed-capsule formation. The samples were collected from seven different populations of each species grown in Udmurtia.

Total hydro-alcohol extractable matter was determined by the method described in Chemical Characterization of Medicinal Plants (1983). For tannins we used Zaprometov (1974), and for hypericins we used the method of Bilinova et al. (1986). All the chemical analysis was replicated five times. Statistical evaluation of the obtained results were determined using dispersion analysis, based on Dospechov (1985).

### RESULTS

#### Hypericins

The highest hypericin content (1.20%) in *H. perforatum* and (1.06%) in *H. maculatum* was measured at the seed formation stage (Table 1). During massive flowering period, hypericin content in both species varied

**Table 1.** The content of hypericin, tannin, and total extractable matter in *H. perforatum* and *H. maculatum* in various developmental stages of the plants in the Udmurtian region of Russia (1994–1996 growing seasons).

Stage	Hypericin content (%)	Tannin content (%)	Total extractable matter (%)
<b><i>Hypericum perforatum</i></b>			
Vegetative	0.57	16.20	29.90
Massive flower buds	1.20	10.30	22.50
Massive flowering	0.72	10.33	27.06
Seed capsule formation	0.29	5.60	16.50
LSD 5%	0.17	1.21	2.16
<b><i>Hypericum maculatum</i></b>			
Vegetative	0.55	9.47	30.25
Massive flower buds	1.06	10.89	29.90
Massive flowering	0.71	11.06	27.40
Seed capsule formation	0.33	12.72	17.65
LSD 5%	0.11	1.02	0.00

from 0.70% to 0.74% (Table 1). The lowest content (0.29% for *H. perforatum*, and 0.33% for *H. maculatum*) was measured at the fruiting or 4th plant developmental stage (Table 1).

### **Tannins**

Maximum content of tannins (16.20%) in *H. perforatum* was measured during intensive vegetative growth (Table 1). With the onset of flowering, the content of tannin in *H. perforatum* declined. The lowest tannin content (5.60%) for *H. perforatum* was measured during seed capsules formation (Table 1). Unlike *H. perforatum*, the tannin content in *H. maculatum* increased with further development of the plants from the vegetative phase (9.47%) to flowering (12.72%) (Table 1).

### **Total Extractable Matter**

The highest content of the total extractable matter (29.90% for *H. perforatum*, and 30.25% for *H. maculatum*) was found at the 1<sup>st</sup> stage (intensive vegetative development) with the lowest value of 16.50% for *H. perforatum* and 17.65% for *H. maculatum* at seed capsule formation (Table 1). In general, the mean content of the total extractable matter in *H. maculatum* was slightly higher (28.28%) than *H. perforatum* (24.92%).

Though both *H. perforatum*, and *H. maculatum* start their growth during spring at similar time, *H. maculatum* started flower bud formation, flowering, and seed ripening 7–10 days earlier than *H. perforatum* (data not shown). From our investigation, it appears that both *H. perforatum* and *H. maculatum* grown in the Udmurtian regions of Russia have similar biochemical traits. Therefore, we suggest that *H. maculatum* should be included in the State Pharmacopoeia Books, as a source of an herbal medicine.

### **REFERENCES**

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