

PHENOLIC AND SUGAR COMPOSITIONS OF SOME *Hieracium* L. (ASTERACEAE) LEAVES IN NORTH EAST ANATOLIA

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Summary: In this study, the contents of total phenolic substances, hexose and pentose, glucose and reducing sugar in leaves of four endemic species of *Hieracium* (*H. hypopityforme*, *H. karogoellense*, *H. microtum* and *H. gentiliforme*) were analysed. The highest content of total phenols was quantified in the leaves of *H. karogoellense* (31.78 mg/g DW) while the highest contents of pentoses, hexoses and glucose were found in the leaves of *H. microtum*. Reducing sugar levels in the leaves of *H. hypopityforme*, and *H. gentiliforme* were richer than those of *H. karogoellense* and *H. microtum*. The results showed that leaves of the *Hieracium* species were very rich in phenolic substances and sugars.

Key words: Endemic species, *Hieracium*, phenolics, sugars.

Introduction

Hieracium L. is a large genus of perennial herbs well known for its taxonomic complexity (Geraldýne, 1978). Nearly 10 000 mostly apomictic species of *Hieracium* have been described up to now (Beaman, 1990). The genus, *Hieracium*, according to the monography by Zahn (1921–1923) is divided into four subgenera and two of these, *Hieracium* and *Pilosella*, are reported for the flora of Turkey. Sell and West (1974) who prepared the account of *Hieracium* recognized these two subgenera as a distinct genus.

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Hieracium species are important components of natural ecosystem. They never pose a problem as weeds, but often are considered desirable and beneficial, not only for the environment, but also for some of their properties. For instance, *H. pilosella* has medical properties. Several species of *Hieracium* at the blooming stage, including the root, are used for infusions and tinctures. Also the plants have antibiotic properties and are used against dropsy, nephritis, gout, dyspna, hemoptysis, cardiac oedema, diarrhoea and intermittent fevers (Fornasari, 1996). In addition, *Hieracium* species are an important source of nectar for honeybees and can be eaten by livestock providing a complementary source of foods. Several reports on the chemical composition of *Hieracium* species have appeared in the literature but no comprehensive chemotaxonomic study has been done on this genus. In recent years the genus *Hieracium* has been the subject of chemical (Manez et al., 1994, Petrovich et al., 1999a,b), ecological (Fornasari, 1996), taxonomical (Jun, 1997), genetical (Koltunow et al., 1998), karyological (Selvi and Fiorini, 1996) and molecular studies (Nybon, 1996; Shi et al., 1996). However there are no any records about these endemic *Hieracium* species. Thus, in this study, it was determined and compared the contents of phenolic substances and soluble sugar in the leaves of four *Hieracium* species.

Materials and methods

Plant Material

Leaves of *H. hypopityforme* Juxip, *H. karogoellense* (Zahn) Sell & West, *H. microtum* Boiss. and *H. gentiliforme* (Zahn) Sell and West were used as a plant materials in this study. They were collected from the mountains of North East Anatolia between 1998 and 1999 during the flowering season, and identified by using the Flora of Turkey and the East Aegean Islands (Sell and West, 1975). The vouchers of these species were kept in the Herbarium of Biology, Karadeniz Technical University (KTUB).

Determination of Phenolic Content

The total phenols in the leaves were extracted using a modified procedure described by Walter et al. (1979). A 2 g sample of leaves was homogenized in a warring blender with 20 ml 95% ethanol for 2 min. Then 3 ml of homogenate was evaporated and alcohol was removed. The residue was mixed with 15 ml of 0.1 M sodium phosphate buffer (pH 6.3) and passed through four layers of cheesecloth. Absorbances were measured with and without dowex (chloride form) at 323 nm. The total phenols were determined on a standard curve prepared at the same time.

Determination of Hexose and Pentose Content

Hexose and pentose contents were determined by phenol - sulphuric methods (Dubois et al., 1956). A standard curve was prepared to quantify hexose and pentose. Two

grams leaves were extracted in distilled water and centrifuged at 3 000 rpm for 5 min. The extracts were treated with a pure sulphuric acid and phenol (5%) and then their absorbances were measured at 480, 488 and 490 nm for pentose, hexose and glucose respectively.

4. Determination of Reducing Sugars

Reducing sugars were analyzed as described by Ross (1959). Plants were harvested and dried at 60°C. Every sample was grinded with glass powder and suspended in distilled water. After filtration, the samples were suspended in distilled water and filtered through Whatman No1 filter paper. 1 ml of the filtrate was added to 3 ml of di-nitrophenol solution (0.038 M). The mixtures were incubated at 65–70°C for 6 min. and then cooled under running water. Changes were estimated at 600 nm spectrophotometrically.

Results and Discussion

This study is a first report about phenolic and sugar compositions of four endemic species of *Hieracium* distributed in NE Anatolia.

Phenols amounts in leaves of the examined species are shown in Fig. 1. The highest content of total phenols was quantified in the *H. karagoellense*. However phenolic

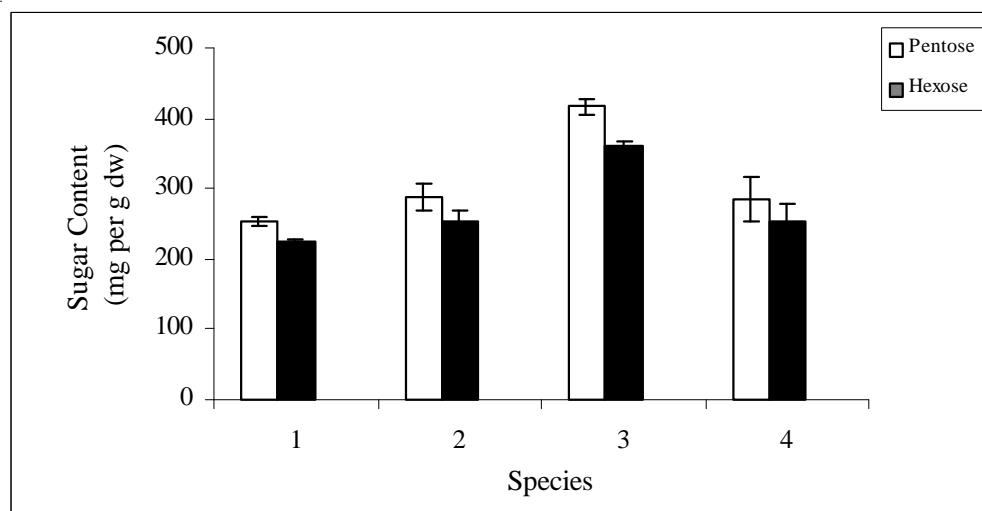


Figure 1. Total phenols, reducing sugars and glucose contents of four *Hieracium* species: 1–*H. hypopityforme*, 2 –*H. karagoellense*, 3 –*H. microtum*, 4 –*H. gentiliforme*. Vertical bars represent standart deviations of the means of three replications.

substances contents were found 17.77, 14.73 and 13.38 mg/g dw, in *H. hypopifyforme*, *H. microtum* and *H. gentiliforme* respectively. We recorded that *H. karagoellense* has more than 2 fold total phenolic substances from *H. microtum* and *H. gentiliforme*. *Hieracium* species have antagonistic effects on the growth of other plants because of phytotoxic agents washed into the soil from the leaves. Seven phenolic compounds were found to be released by *H. aurantiacum* on land where allelopathic effects were observed (Dawes and Maravolo, 1973). Parallel to these results, we have also determined that the leaves of four endemic *Hieracium* have a high concentration of phenolic substances. Especially it can be said that *H. karagoellense* has higher allelopathic effects than the other ones.

As seen in Fig. 2, there are some differences in the levels of hexose and pentose in leaves of these species. The highest contents of hexose and pentose were determined in *H. microtum*. Glucose contents were also determined in leaves of the species (Fig. 1). The highest value of glucose was obtained in *H. microtum*. The other species have approximately the same amounts of glucose. In addition, as shown in Fig. 1, the reducing sugar content of *H. hypopityforme* is similar to that of *H. gentiliforme*, while that of *H. karagoellense* is similar to that of *H. microtum*. The content and composition of plant leaves are known to differ greatly among varieties and lines according to their

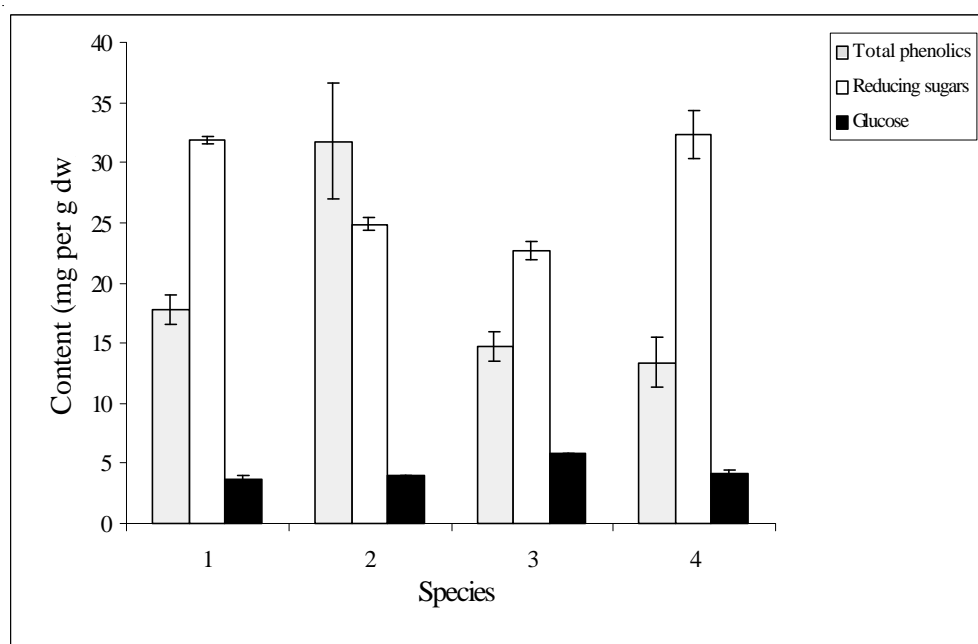


Figure 2. Pentose and hexose contents of four *Hieracium* species: 1 – *H. hypopityforme*, 2 – *H. karagoellense*, 3 – *H. microtum*, 4 – *H. gentiliforme*. Vertical bars represent standard deviations of the means of three replications.

habitats. But our samples were collected in areas that have similar climatic parameters. For this reason our results can aid in the assessment of adequate chemotaxonomic information. Similar studies (Fornasari 1996, Manez et al. 1994) in which taxonomic value and phylogenetic amplifications of phenolic substances have been discussed were also made for *Hieracium* species. Manez et al. (1994) reported that the species belonging to the *Hieracium* line show a general homogeneity, *H. compositum* and *H. amplexicaule* are chemically equivalent, with few quantitative differences. In accordance with Manez et al. (1994), few quantitative differences among examined species were determined in this study.

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