

REFERENCES

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Preliminary Studies with *Nepeta Glechoma* *

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Nepeta Glechoma, Benth (*Glechoma hederacea*, L), more commonly called Ground Ivy or Gill-over-the-ground, is beautiful when grown under controlled conditions in a rock garden, but is a pesty weed when it escapes. The plant is a common member of the *Labiatae*, naturalized from Europe and recognized by square stems and more or less two-lipped corollas.

One of the authors was led by curiosity to ascertain something of the chemical nature of this member of the mint family. Unfortunately, much of the "weed" had been discarded before the inspiration came to attempt an investigation. Upon consultation with the U. S. Department of Agriculture, there were furnished two brief references (1, 2), stating that Schimmel and Co. had distilled 0.03 per cent of the volatile unpleasant-smelling oil from the plant; the oil has a dark green color; that H. Haensel had obtained 0.064 per cent of oil from the dry herb, with a density of 0.9296 at 21° C.; that the oil showed traces of aldehyde or ketone; and that tannin and bitter substances were present. No other references have been found to this variety of *Nepeta*. However, brief statements were found concerning the following varieties of *Nepeta*: *N. Botryoides* (3); *N. Botryoides-Artemisia* S. minor (3); *N. Bucharia*, *N. Grandiflora* and *N. Podstachys* (4); *N. Cataria* (seeds) (5).

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EXPERIMENTAL

Preparation of the Material.—During the spring and summer of 1939 the creeping *Nepeta* was pulled from the ground at a time when its blue flowers were dropping. Flowers (Fig. 1) and fine roots were severed as completely as possible. The plant was washed frequently until no dirt settled from the wash water. The plant was drained and dried and a distillation was made with steam. More plant was gathered later with flowers and some seed (Fig. 2). From this crop a small vial of seed was obtained. During the summer other crops were obtained, washed thoroughly and air-dried for approximately six months. Evidently, during this long drying process some oil was lost.

Steam Distillation.—The cut or crumpled plant, largely the leaves with their oil sacs (Fig. 3), was steam-distilled with a collection of 1000 cc. to 2000 cc. of distillate. At first, small droplets of a faintly yellow-colored oil appeared, that later disappeared into the water of the distillate making it faintly milky. This was shaken with redistilled chloroform, the chloroform evaporated spontaneously and the residue weighed to constant weight. The extracted water retained a faint odor of the oil, was slightly milky and the emulsion was not disturbed by any solvent, but it cleared immediately upon addition of dilute NaOH. Dilute HCl did not do this.

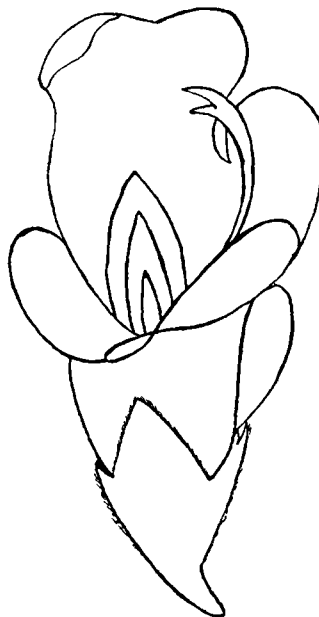


Fig. 1.—Flower.

Flower is bell-shaped, 1 cm. in length, violet-blue in color with a deep maroon-red center. Corolla is about thrice the length of the calyx. Calyx is covered with non-glandular trichomes. Anther cells diverge at right angles, each pair approximate and forming a cross.

Physical Properties of the Oil.—The residue from the chloroform was reddish yellow and it had an unpleasant odor. Chloroform, ether, benzene and alcohol were found to be good solvents. If a solution was filtered with a small amount of Darco, the reddish color disappeared, and the recovered oil substance dried to a waxy, but apparently crystalline residue, especially upon slight chilling. Probably the melting temperature is slightly below room temperature. Neither the melting temperature nor the refractive index of the material could be taken because of the very small amount of material on hand. When softened and drawn into a capillary tube, the specific gravity was found to be 1.000.

Physical properties of the Distillate.—Of the semi-crystalline, waxy substance, only 0.0730 Gm. was obtained from four distillations. This darkened upon exposure to the air, but could be purified by

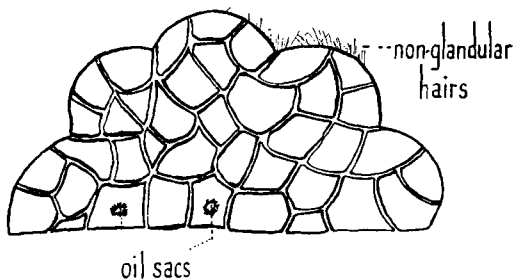


Fig. 3.—Leaf.

The leaf is 1 to 2 cm. in diameter, petioled, round, kidney-shaped, crenate and green on both sides; covered with non-glandular trichomes; venation reticulate. Oil sacs appear as depressions lighter in color than surrounding area.

Table I.—Results of Steam Distillation

Plant Condition	Weight of Material, Gm.	Volume of Distillate, Cc.	Waxy Product		pH of	
			Gm.	%	Distillate	Plant Liquor
Air-dried	100	2000	7.47	5.47
Fresh	109	1300	0.0162	0.0148	5.89	5.55
Very dry	100	1500	0.0233	0.0233	6.49	5.67
Very dry	100	2000	0.0177	0.0177	6.90	5.43

redistillation with steam. It showed probable phenolic and aldehydic characteristics, and unsaturation.

Seed.—An effort to obtain an ether extract of the crushed seeds met with failure because of an unpredictable accident.¹ The seed gave 7.9 per cent of ash.

Plant Ash.—A large burlap bag full of the plant had been dried for six months. It was reduced to

fine powder with a meat grinder. Seven determinations of the ash contents gave an average of 11.63 per cent. Spectroscopically, the ash revealed K, Na, Ca, Ba and traces of Li. With methyl alcohol and sulfuric acid, the ash showed traces of boron. A sodium carbonate fusion showed Fe, Al, Si, Ca and Mg. Treated with HCl, the ash showed the presence of carbonates. A trace of Mn was shown by the borax bead test. Sodium fusion of the dried plant gave a positive test for N with traces of Cl, P and S. Carbon, hydrogen and oxygen, of course are present in the chlorophyll.

The thanks of the authors are extended to Dr. Frank Eby for valuable assistance in his botanical laboratory.

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Fig. 2.—Seed.

The seed is about 0.5 mm. in diameter and about 1 to 2 mm. long. Ovoid in shape, slightly roughened exterior, seemingly pitted; vanilla-brown in color. White hilum at base is loop-shaped; seed coat tough.

¹ Plumbers opened all faucets, two floors below, and thereby drained the water condenser of an ether extraction Soxhlet apparatus, with resulting destruction of apparatus and contents.