

BOTANY

CYTOTAXONOMIC NOTES ON SOME GALIUM SPECIES. B

BY

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7. *Galium tricornutum* Dandy (fig. 7).

Plants grown up from seeds collected in the wild were cultivated in the experimental garden. These plants were investigated cytologically and morphologically. They turned out to be tetraploids with $2n = 44$ chromosomes. This is the same number as reported by FAGERLIND (1937) in material from unknown origin and by VAN LOON (1974) in plants from Lanzarote, the Canaries.

The metaphase-plates of roottip mitosis have a regular pattern, but some difference in length of the chromosomes can be observed. B-chromosomes or satellites are not present (fig. 10.5).

Morphological comparison of the material cultivated did not show appreciable differences.

Galium tricornutum Dandy is an annual, 30–60 cm high, sometimes up to 80 cm, with stems decumbent or ascending, quadrangular with green-white ribs. Leaves in whorls of 6–8, linear-lanceolate, mucronate, 1–3 cm long and 1–2 mm wide, one-veined.

The ribs of the stems, the margin of the leaves, the vein of the leaf and the pedicels rough by retrorse prickles.

Flowers mostly in three-flowered axillary cymes, greenish-white or creamy white, with four acute lobes, 1–1.5 mm in diameter. Pedicels strongly reflexed during maturing of the fruits. Fruits 3–4 mm in diameter, granulate with acuminate papillae.

Flowering time from June to the end of September.

Originally a mediterranean species (Southern Europe, Asia Minor, the North of Africa), it became widespread afterwards through the whole of Europe.

ORIGIN OF THE MATERIAL INVESTIGATED:

GERMANY: K-549, K-716, Sangerhausen, Saxony, D.D.R.; K-547, Eichsfeld Gebirge, Thüringen, D.D.R.

PORTUGAL: K-329, Vale de Figueiras.

U.S.S.R.: K-146, Ashkabad; K-449, Armenia; K-638, Tourcomania.

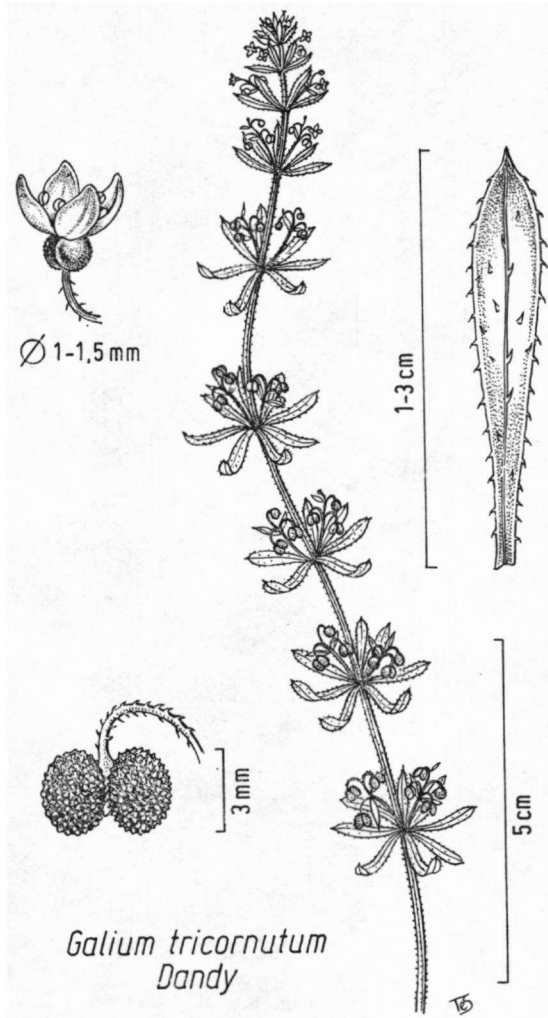


Fig. 7.

8. *Galium verrucosum* Huds. (fig. 8).

Plants from seeds collected in nature in Portugal, Spain and Hungary showed diploids with $2n = 22$ chromosomes. (Fig. 10.9). In one case tetraploids with $2n = 44$ chromosomes were observed in plants obtained from seeds collected in Santa-Clara, near Coimbra, Portugal.

Diploids are also known from the literature (HOMEYER, 1932, 1935; FAGERLIND, 1934, 1937). It is clearly the most widespread cytotype.

Morphological investigations could not demonstrate differences between the two cytotypes in characters as the height of the plants, stems, length of the internodes, length of the pedicels, flower size or indument. Some differences in length and width of the leaves and the size of the fruits

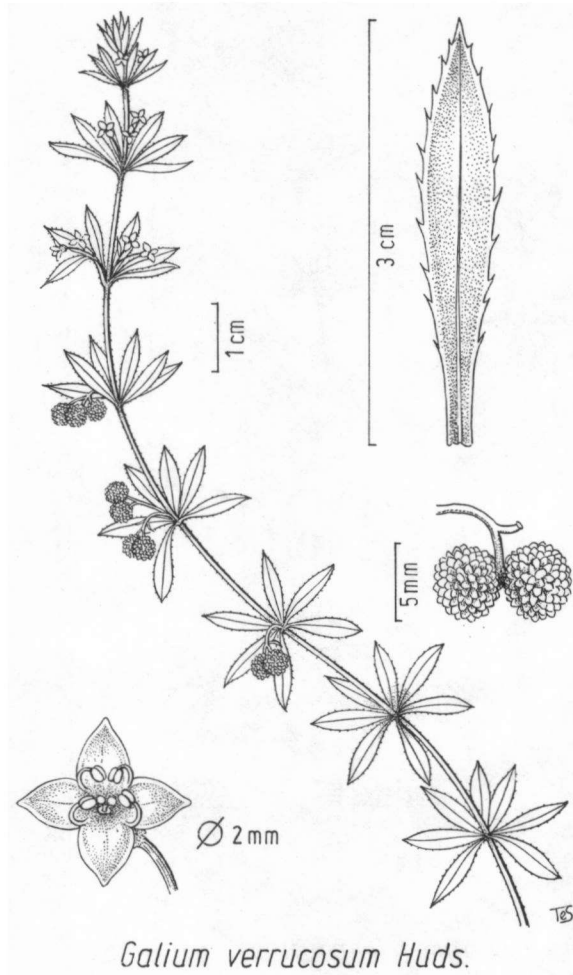


Fig. 8.

seemed to be present. Measurements confirmed this for the fruits and the width of the leaves. The length of the leaves, however, cannot be used as a discriminating character, due to a great amount of overlap. A clear and pronounced difference in size of stomata between the two cytotypes is present, the diploid in having smaller stomata in comparison to those of the tetraploid.

The results of these measurements are given in a table below. In this table \bar{X} = the mean, SD the standard deviation, SE the standard error of the mean and N the number of observations. The measurements of the leaves were made on ten leaves of five diploid and five tetraploid plants. For the fruit measurements 20 fruits were chosen on a plant from each of nine diploids and three tetraploids, and for the calculations of stomata size 25 stomata in four plants of each cytotype were measured.

TABLE I

Size of leaves, fruits and stomata of diploid and tetraploid *Galium verrucosum* Huds., \bar{X} =the mean, SE=standard error of the mean, SD=standard deviation and N=the number of observations.

		$\bar{X} \pm$	SE	SD	N	
Leaves in mm	length	2n=22	20.58	0.20	1.65	50
		44	19.80	0.27	1.88	50
	width	22	2.97	0.05	0.32	50
		44	3.56	0.06	0.47	50
Fruits in mm	2n=22	32.27	0.35	4.66	180	
	44	42.08	0.38	2.91	60	
Stomata in micron	2n=22	31.16	0.45	4.00	100	
	44	37.47	0.45	4.50	100	

Galium verrucosum is an annual, up to 30 cm high, roots thin, wiry forming a strangled mass, mostly dark yellow to red. Stem prostrate or ascending, branched, quadrangular, the angles rough by retrorse prickles. Leaves in whorls of 4-6, rarely more, light green, linear or lanceolate to 2 cm long and 0.3 (0.4) cm wide, with a pointed hyaline apex, clearly visible midvein, entire, the margins with antrorse prickles. Flowers mostly solitary in the leaf axels, sometimes three, 0.2 cm broad, greenish-white. Fruit bipartite, large, to 6 mm thick, densely verrucose.

Flowering time: June-July.

Occurring in Southern Europe, Asia Minor, Syria and North-Africa.

ORIGIN MATERIAL INVESTIGATED:

Diploids:

HUNGARY: K-291, near Gödöllő.

PORTUGAL: K-243, K-479, Estremadura, Agronomica Nacional; K-180, Estremadura, Vale do Picheleiro; K-283, Elras, Coimbra; K-573, St. Clara, near Coimbra.

SPAIN: K-669, Murcia, Puerto Lumbreras.

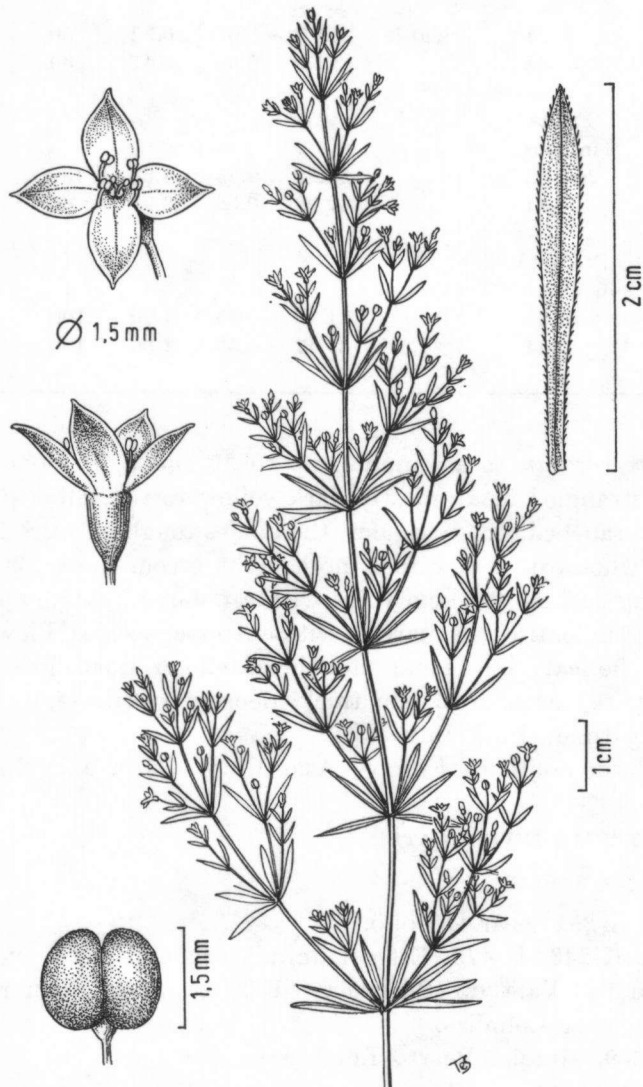
Tetraploid:

PORTUGAL: K-339, St. Clara, near Coimbra.

9. *Galium purpureum* L. (*Asperula purpurea* (L.) Ehrend.) (fig. 9).

Galium purpureum L. is a Southern European species. Its area reaches from the Provence in France to the Dardanelles in Turkey. Northwards to the South of Switzerland, Austria and Hungary.

Seeds collected at random in populations in the wild in ITALY: the peninsula of Portofino near San Fruttuosa (K-213*), SWITZERLAND: Tessin, borders of Lake Lugano near San Dominico (K-220*, K-462*) and Monte San Salvatore near Ciona (K-222*, K-223* and K-227*) and AUSTRIA: Carinthia (K-290, K-500*) were sown. After germination the



Galium purpureum L.

Fig. 9.

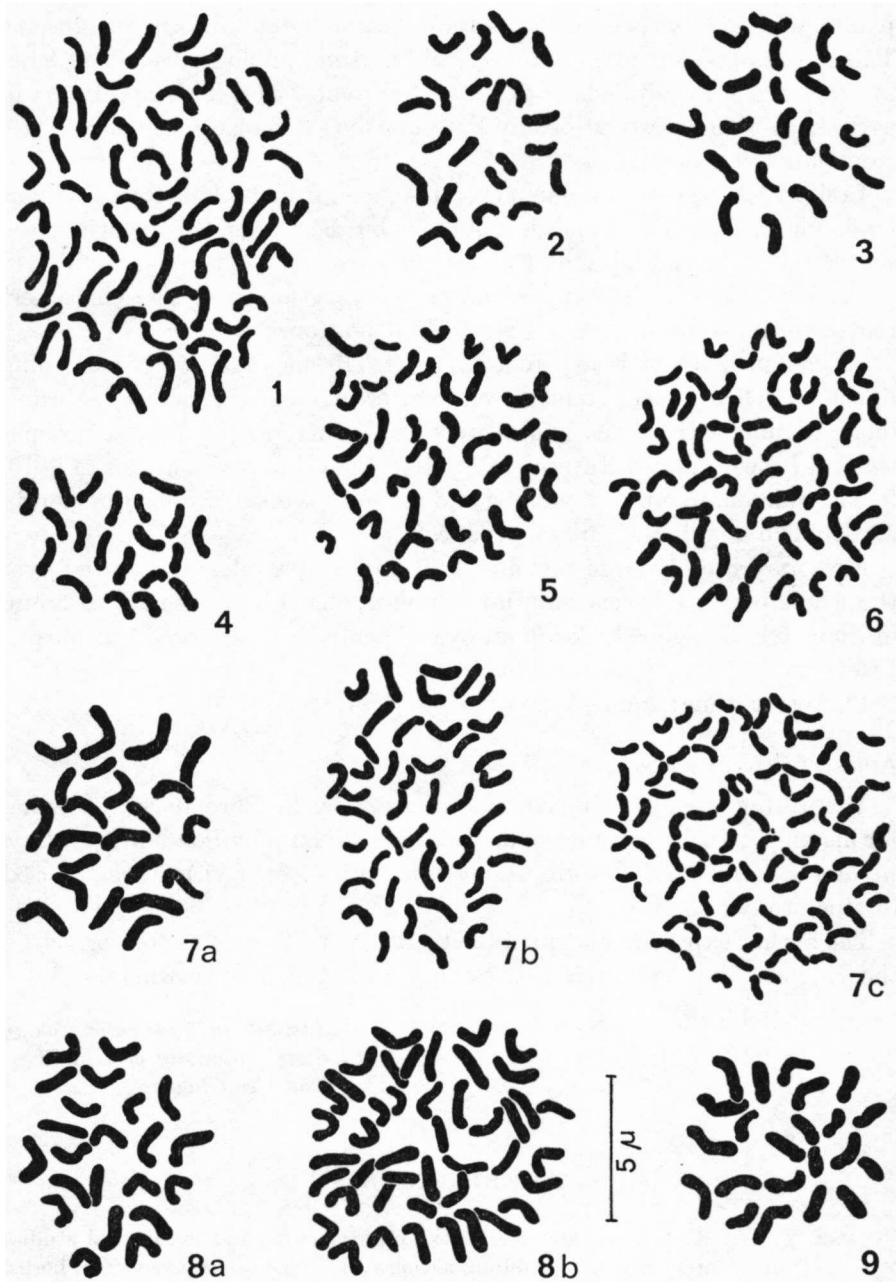


Fig. 10.

Fig. 10. Mitotic metaphase plates of *Galium* species: 1=*G. arenarium* Lois., $2n=66$; 2=*G. purpureum* L., $2n=22$; 3=*G. rotundifolium* L., $2n=22$; 4=*G. spurium* L., $2n=20$; 5=*G. tricornutum* Dandy, $2n=44$; 6=*G. triflorum* Mich., $2n=66$; 7^a=*G. oelandicum* (Stern. et Hyl.) Ehrend., $2n=22$; 7^b=*G. sterneri* Ehrend., $2n=44$; 7^c=*G. pumilum* Murr., $2n=88$; 8^a=*G. uliginosum* L., diploid, $2n=22$; 8^b=*G. uliginosum* L., tetraploid, $2n=44$; 9=*G. verrucosum* Huds., $2n=22$.

plants were cultivated during several years under uniform conditions. This material was studied cytologically and morphologically. The plants investigated were diploids with $2n = 22$ chromosomes. This number is in agreement with investigations by FAGERLIND (1934) on *Galium purpureum* from unknown origin.

In fig. 10.2 the chromosome portrait is given from a plant from Switzerland, found near San Dominico. As can be seen from this drawing, the portrait is regular and shows a normal pattern.

In morphological respect the plants are very uniform. The characters remained constant over the years of cultivation.

Galium purpureum is a perennial, up to 40 cm high, with a creeping much branched, stock, stems ascending, erect, much branched, glabrous, quadrangular with ribbed angles with small antrorse prickles, sometimes turning brown-reddish. Internodes up to 2.5 cm. Leaves in whorls of 5–10, linear, mucronate, up to 2 cm long and to 1 mm wide, glabrous, the margin and midrib rough by curved prickles.

Flowers profusely from few-flowered axillary panicles distributed over the whole plant. Pedicels thin, up to 2 mm long. Flowers small, to 2 mm in diameter, four-lobed, the lobes ovate, acute, brown to reddish-purple. Fruits to 1.5 mm, glabrous, black.

Flowering time: June–August.

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