

## ALKALOIDS OF *Genista tinctoria* L. GROWING IN TURKEY

Fatma TOSUN (\*) Mekin TANKER (\*\*) Ali TOSUN (\*\*\*) Tuncel ÖZDEN (\*\*\*\*)

### TÜRKİYE'DE YETİŞEN *Genista tinctoria* L. BİTKİSİNİN ALKALOİTLERİ

#### ÖZET

*Bu çalışmada, Türkiye'de yetişen Genista tinctoria L. (Fabaceae) bitkisinin topraküstü kısımlarında bulunan alkaloidler preparatif ince tabaka kromatografisi ile izole edildi. İzole edilen sekiz alkaloidin yapısı fiziksel ve spektral özelliklerinden yararlanılarak aydınlatıldı.*

#### SUMMARY

*In this study, the alkaloids of the aerial parts of Genista tinctoria L. (Fabaceae) growing in Turkey were isolated by preparative TLC. The structure of eight isolated alkaloids were elucidated according to their physical and spectral properties.*

#### Key Words:

*Alkaloids, Genista tinctoria.*

(\*) Gazi University, Faculty of Pharmacy, Department of Pharmacognosy, 06330, Ankara.

(\*\*) Ankara University, Faculty of Pharmacy, Department of Pharmacognosy, 06100, Ankara.

(\*\*\*) Gazi University, Faculty of Pharmacy, Department of Pharmaceutical Chemistry, 06330, Ankara.

(\*\*\*\*) Karadeniz Technical University, Faculty of Education, Department of Chemistry, Trabzon.

## INTRODUCTION

*Genista tinctoria* L. is a non-spiny shrub distributed throughout most of Europe and extending to Turkey and the Near East; Southern limit includes North and North-East Spain, Sicily but not Corsica, Sardinia or the Greek Islands. Northern limit includes Lithuania and Ukraine, and eastwards to the Ural mountains (1).

*G. tinctoria* is reported to be diuretic, emetic, laxative, purgative and sudorific. Dyer's broom is a folk remedy for cancer, dropsy, gout, hepatosis, nephrolithiasis, nephrosis, rheumatism, splenosis and wens. All parts, especially the flowers of *G. tinctoria* had been employed by Romans for dyeing, yielding a good yellow dye. Seeds were used as a coffee substitute. Iberians make cloth from the fibers. If cows eat the plant, it may make the milk (and butter and cheese) bitter. Still, the plant is said to enrich poor soil, probably via nitrogen fixation (2,3).

*G. tinctoria* is known to contain alkaloids, flavonoids, essential oils, fats, waxes, tannins and musilage (3,11).

Although there are a few publications on the alkaloids of *G. tinctoria* (4-8), there is no report in the literature dealing with the alkaloids of *G. tinctoria* growing in Turkey. In the present paper, we report the alkaloids obtained from the aerial parts of *G. tinctoria* collected in the vicinity of Bursa, Turkey.

## MATERIAL and METHODS

### Plant Material

*G. tinctoria* used in this study was collected during its flowering period from Tahtaköprü forest (Bursa, Turkey). Voucher specimens are deposited in "Ankara Üniversitesi Eczacılık Fakültesi Herbaryumu (AEF No. 12698)", Ankara, Turkey.

### Equipments

Titrimetric method was used to estimate the total alkaloid content (12). TLC was performed on silica gel GF<sub>254</sub> (Merck) plates in three solvent systems (S<sub>1</sub>, cyclohexane: diethylamine = 7:3; S<sub>2</sub>, chloroform: methanol: 25 % ammonium hydroxide = 85:15:1; S<sub>3</sub>, methanol: 25 % ammonium hydroxide = 131:2). Preparative TLC was carried out using S<sub>1</sub> and S<sub>2</sub> solvent systems. Melting points were determined on a Buchi 510 Melting Point Apparatus and are uncorrected. IR spectra were run in KBr discs with a Perkin Elmer 1330 IR Spectrophotometer. Mass spectra were recorded on a Finnigan Mat GS/MS 1020 Spectrometer.

## Extraction and Isolation of Alkaloids

The dried and powdered aerial parts of *G. tinctoria* were extracted with methanol in a Soxhlet apparatus. The crude alkaloidal mixture was obtained as previously described (13). TLC and preparative TLC were performed for examination and isolation of the alkaloids found in the crude alkaloidal mixture as given in references 13 and 14.

## RESULTS and DISCUSSION

In this study, the total alkaloid content of the aerial parts of *G. tinctoria* was found to be 0.58 % by using titrimetric method. Eight quinolizidine alkaloids, isolated from *G. tinctoria* by preparative TLC, were identified as tinctorine, lupanine, tetrahydropyrrolizidine, rhombifoline, anagyrine, N-methylcytisine, cytisine and baptifoline according to their physical and spectral characteristics and by comparison with the previously published data. Anagyrine and N-methylcytisine are the major alkaloids of this plant. The occurrence of tetrahydropyrrolizidine has not previously been reported from *G. tinctoria*. Although sparteine, isosparteine and retamine have been reported from *G. tinctoria* (4,5), we could not detect these alkaloids in our plant material.

The properties of lupanine, tetrahydropyrrolizidine, rhombifoline, anagyrine, N-methylcytisine, cytisine and baptifoline were already given in references 13-15.

Tinctorine, mp of its picrate: 211-2°C (6);  $R_f$ :  $S_1$  0.67,  $S_2$  0.71,  $S_3$  0.44;  $IR \nu_{max}$  (3400, 3090, 2920, 2840, 1635-1605, 1545, 1430, 1335, 1265, 1150, 1075, 910, 780 and 705  $cm^{-1}$ ) and MS (m/e): 244 ( $M^+$ , 24 %), 203 (100), 172 (16), 160 (15), 146 (27), 132 (10), 117 (19), 108 (23), 98 (45), 94 (38), 82 (23), 68 (26), 58 (43), 55 (13) [in Lit. (6)  $M^+$  m/e, 244 (22), 203 (100)].

## REFERENCES

1. Gibbs, P.E. (1966) A Revision of the genus *Genista* L., Notes From the Royal Botanic Garden, Edinburgh, 27 (1), 11-99.
2. Duke, J.A. (1987) Handbook of Medicinal Herbs, p. 206, CRC Press, Inc. Boca Raton, Florida.
3. List, P.H. and Hörhammer, L. (1973) Hager's Handbuch der Pharmazeutischen Praxis, Vol. 4, p. 1110, Springer-Verlag, Berlin.
4. Bernasconi, N., Gill, S. and Steinegger, G. (1965) Versuch einer chemotaxonomisch-phylogenetischen Gliederung des Genus *Genista* anhand der Alkaloidführung, *Pharm. Acta Helv.*, 40 (4), 246-56.
5. Przyborowska, M., Soczewinski, E., Waksmundzki, A. and Golkewicz, W.

- (1967) Investigations on the alkaloids from *G. tinctoria*, **Diss. Pharm. Pharmacol.**, 19 (3), 289-95. Ref. C.A., Vol. 67, 97629 f, 1967.
6. Knöfel, D. and Schütte, H.R. (1970) Chinolizidinalkaloide: Konstitution und Konfiguration von Tinctorin aus *Genista tinctoria* L., **J.Prakt. Chem.**, 312 (5), 887-95.
  7. Gulabov, A., Venkov, A. (1973), A Research of the Alkaloids Contents of *Genista tinctoria* L., **Nauchn. Tr. Plovdivski Univ. Mat., Fiz., Khim., Biol.**, 11(1), 87-9.
  8. Hrochová, V., Sitániová H. (1982) A Pharmacognostical Research of *Taxon Genista tinctoria* L. S.L., **Farm. Obz.**, 51(3), 131-5.
  9. Ulubelen, A., Çetin, E.T., Güran, A., Iyengar, M.A. (1971), Flavonoid compounds of *Genista tinctoria*, **Lloydia**, 34(2), 258-9.
  10. Wagner, A. (1937) Ginster, **Seifensieder-Ztg.**, 64, 907-8.
  11. Tref, W., Ritter, F. und Wittrisch, H. (1926) Über deutsche ätherische Blüthenextraktöle, **J. Prakt. Chem.**, 113, 355-60.
  12. Tosun, F., Tanker, M., Özden, T., Tosun, A. (1985) Alkaloids of *Genista acanthoclada* DC., **J. Fac. Pharm. Ankara**, 15, 9-15.
  13. Idem. (1986) Alkaloids of *Genista anatolica*, **Planta Med.**, 52 (3), 242-3.
  14. Tosun, F. (1986) Alkaloids of *Genista aucheri* Boiss., **GUEDE, J. Fac. Pharm. Gazi**, 3(2), 99-103.
  15. Tosun, F. (1987) Alkaloids of *Genista carinalis* Gris. Growing in Turkey, in Proceedings of the VI. Symposium on Plant Originated Crude Drugs (Ed. B. Şener), 319-21, Gazi Üniv. Basın-Yayın Yüksek Okulu Matbaası, Ankara.