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Taxonomical and ecological study for some species of *Scutellaria* L. (Labiatae family) in Iraq

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Key words: Labiatae, HPLC, protein, chlorophyll, distribution.

Abstract

Morphological, chemical and geographical studies of three species: *Scutellariam ulticauli, Scutellaria pycnotricha* and *S. cutellaria tomentosa* were conducted in Iraq to identify the general and accurate characteristics that contribute to put taxonomic keys for the species studied, and also determined similar and different qualities that help us to know evolutionary relationships among species. In morphological aspect was studied, The *maximum value* for each of stem length ranged from510 mm to 620 mm recorded in *S. pycnotricha*, leave length ranged from 35mm to 66mm recorded in *S. pycnotricha* but There were no clear differences among species in length and width of Nutlet. The determining of five flavonoid compounds by using the technique of high performance liquid chromatography (HPLC) had done, So the highest concentrations of the chlorophyll content for the leaves was 3.83 mg/l in *S. multicaulis*. In geographical distribution, the highest and lowest points of the altitude was record.

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Introduction

The family Lamiaceae (Labiatae, mint family),Labiatae the acceptable alternative name, still the original name (Hatamneia *et al*., 2008) This is due to the flowers which their petals fused into an upper lip and a lower lip (Maria*etal.* 2009), most botanists now use the name Lamiaceae in referring to this family(Naghibi *et al.* 2005). Its the important family of flowering plants. Many species of the family are aromatic plants and often used in folk medicine, as herb species or fragrance (Zhang *et al.* 2010).Other researchers considered traditionally the family very close to Verbenaceae (Jamzad, 2013). The family includes 236 genera and 6,900 to 7,200 species. Some are shrubs, trees, such as teak, or rarely vines (AL-Gohary and Mohamed, 2007). *Scutellaria* L. belongs to the subfamily Scutellarioideae and grows in old and new worlds. Many authors are studied some species of this family such as Cole *et al.* (2007).Our objective was to describe and determine the general characteristics of the external and internal Morphological as well as the chemical content of flavonoids and the chlorophyll content of plant leaves, which help the authors to distinguish among the species.

Materials and methods

Morphological studies

The herbarium material which deposited in Iraq natural history research center and museum, university of Baghdad herbarium was obtained and recorded , then we used for the morphological measurements, So the identification was performed according to Jamzad (2013) This paper was conducted in 2016-2017.

Chemical studies

The flavonoid compounds were detected for the leaves of the three species by HPLC Chromatography analysis following the method of Harborne (1973). Samples was obtained and recorded According to the procedure of Arnon (1994) which followed to determine the concentration of chlorophyll in the leaves. The following calculations done to ascertain sample chlorophyll concentrations.

Chlorophyll a=(12.7×A663) – (2.69×A645) × V/(1000×w)

Chlorophyll b=(22.9×A645) – (4.68×A663) × V/(1000×w)

Total Chlorophyll=20.2 (A645)+8.02(A663)×V/(1000×w).

Geographical distribution

The information about all the collection date of our species was recorded. It was used for excellence and comparison and to find the the *differences* among studied species.

Results and discussion

Variation in morphological features of the three species including stem length, leaf length, leaf width, ovary, stamen, nutlet length and nutlet width was presented in Table 1.

Table 1. Morphological features of the three species.

No	species	Stem length mm	Leaf length mm	Leaf width mm	Ovary mm	Stamen mm	Nutlet length mm	Nutlet width mm
1	*S. multicaulis*	275-388	10-15	5-10	0.5-0.8	14-18	1.2-1.6	0.7-0.9
2	*S .pycnotricha*	510-620	30-65	13-26	0.4-0.8	17-22	1.3-1.7	0.6-0.8
3	*S. tomentosa*	155-255	11-23	5-10	0.5-1	10-22	1.2-1.6	0.6-0.8

The general study of morphology gave clear features of these plants because assemblage of species features we found it very useful in delimitation and identification for our genus and their species in this family. According to the results obtained it was found that the species *S. tomentosa* record the lowest value of stem length which ranged from 155mm to 255mm while *S. pycnotricha* record the highest value of stem length which ranged from 510mm. to 620mm. Also the two species *S.* multicaulis, *S. tomentosaare*

similar in leaf widthvalue ranged from 5 mm. to10 mm. and also innutlet length which ranged from 1.2 mm. to 1.6 mm. All this agreement with Kahraman *et al.* (2009). These distinguishing characteristics can used to put the key for the species taxonomy Ozdemir and Ahan (2005) reported about the importance of morphological study in plant taxonomy.

Table 2. chlorophyll content of the three species.

No	species	cha	chb	Total
1	*S. multicaulis*	2.17	1.70	3.87
2	*S. pycnotricha*	1.97	0.90	2.87
3	*S. tomentosa*	1.88	1.58	3.46

Table 3. The flavonoids compenant of the three species.

no	FlavonoidCompounds	Retention time	Area
1	kaempherol	6.15	33186
2	Isorhamnetin	9.44	31843
3	isorhamnetin 3-glucoside	15.37	68432
4	Quercetin	24.11	30652
5	Rutin	29.15	43818

Differences in the flowering and fruiting period were observed for the studied species(table 2).We found that the period of fruiting was in July for *S. multicaulis* and in June for *S. pycnotricha* but for the species *S. tomentosa* was in May (Fig. 2).Our results identical to that found by Muhittin and Meryem (2008).

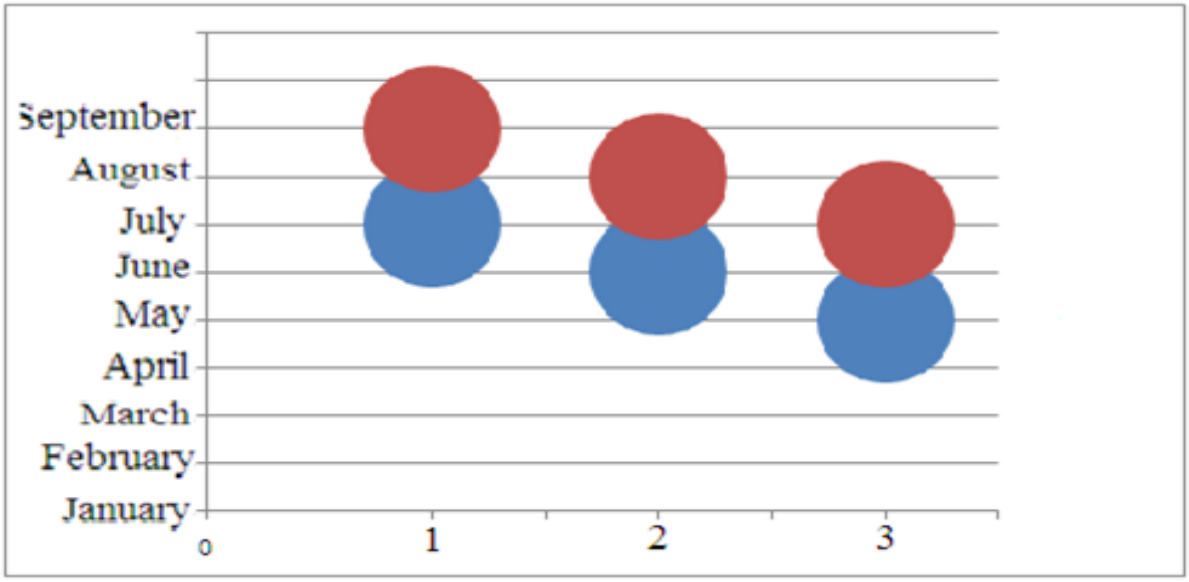

Fig. 1. Flowering and fruiting period for the three species.

We measured the chlorophyll content: cha (a specific form for chlorophyll) used in oxygen icphotosyn the sis. It absorbs most energy from wavelengths of violet-blue and orange-red light) and chb, which the concentration was measured at a stage a flowering stage and the results showedthat the species *S. multicaulis* gave the highest value which was 2.17 mg/l but the species *S. tomentosa* gave the less value which was1.88 mg/l.So the range of chb between 0.90-1.70 (mg/l) in our species (table 2).

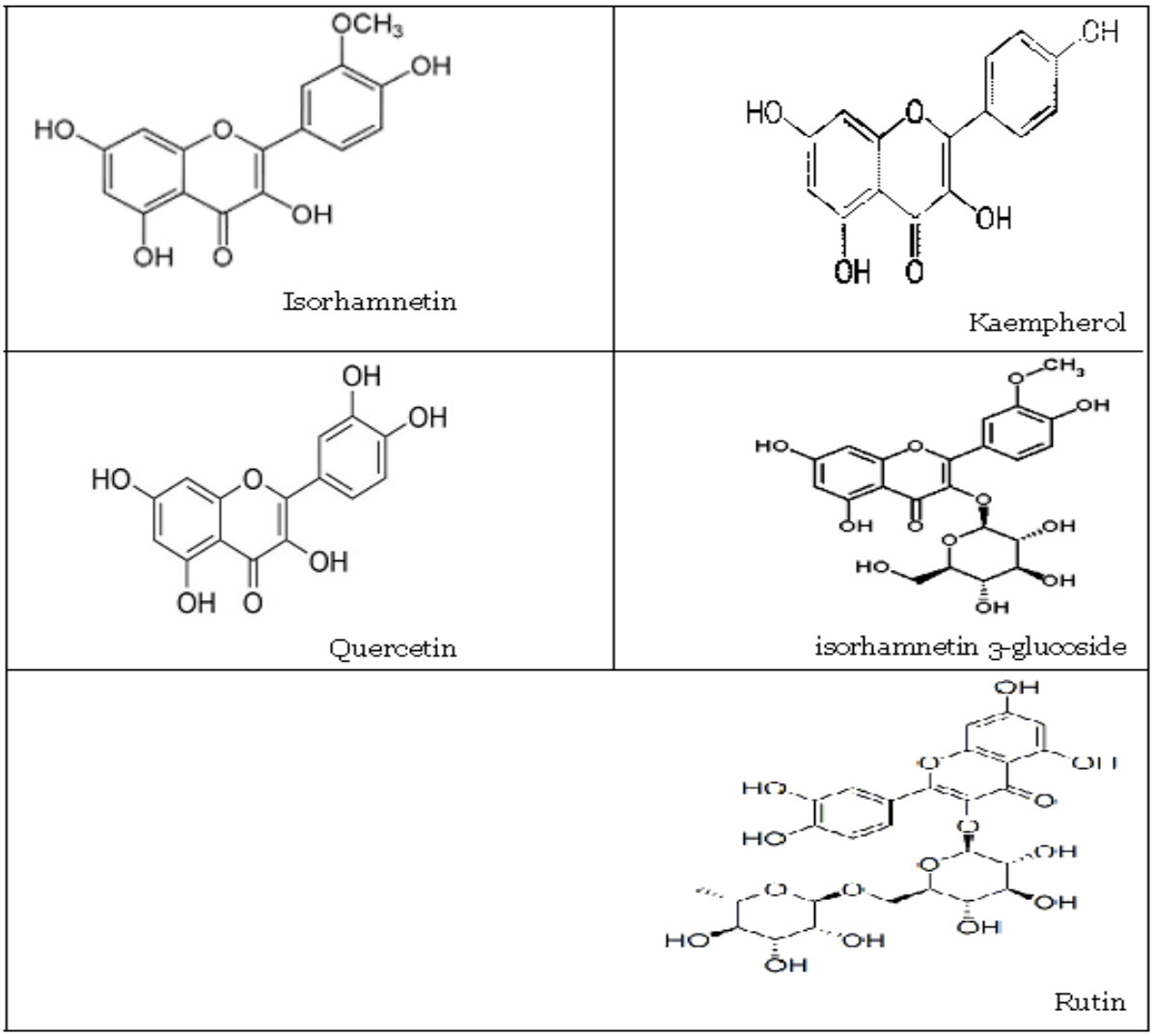

Fig. 2. The structure of five flavonoid component.

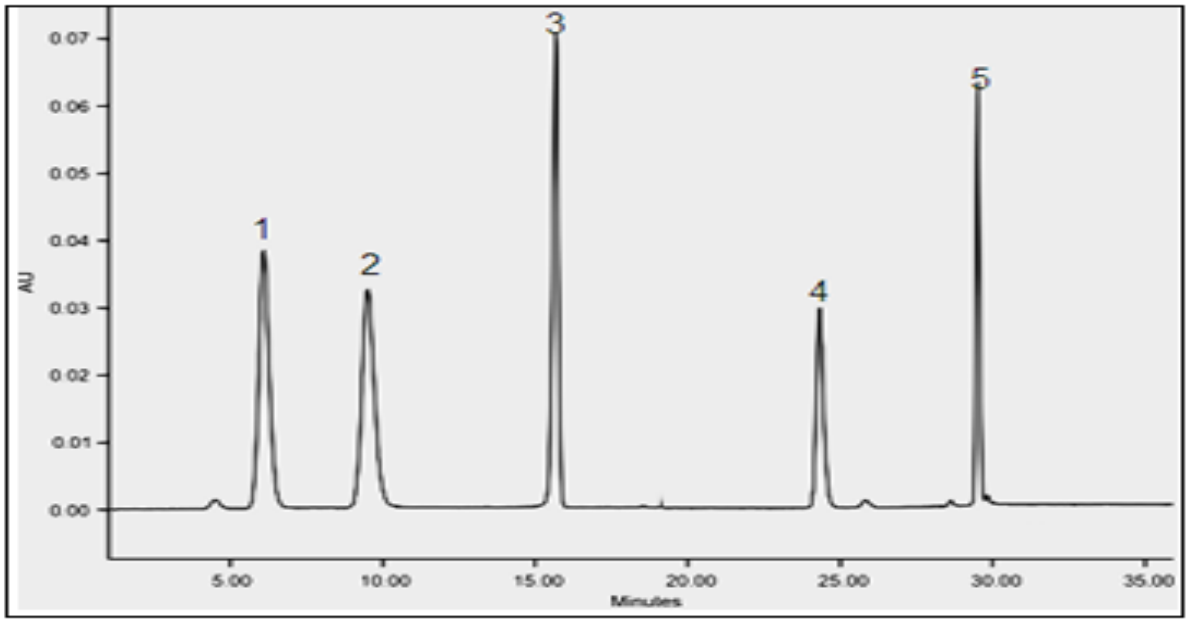

Fig. 3. Separation of five flavonoid standards.

According to Rausher (2016) the difference in chlorophyll content may be due to the different environmental condition that surrounding the plant species and variation geographical location. The researchers Harborneand Williams (2000) also confirmed this in their study and they also explained that it may be due to genetic reasons.

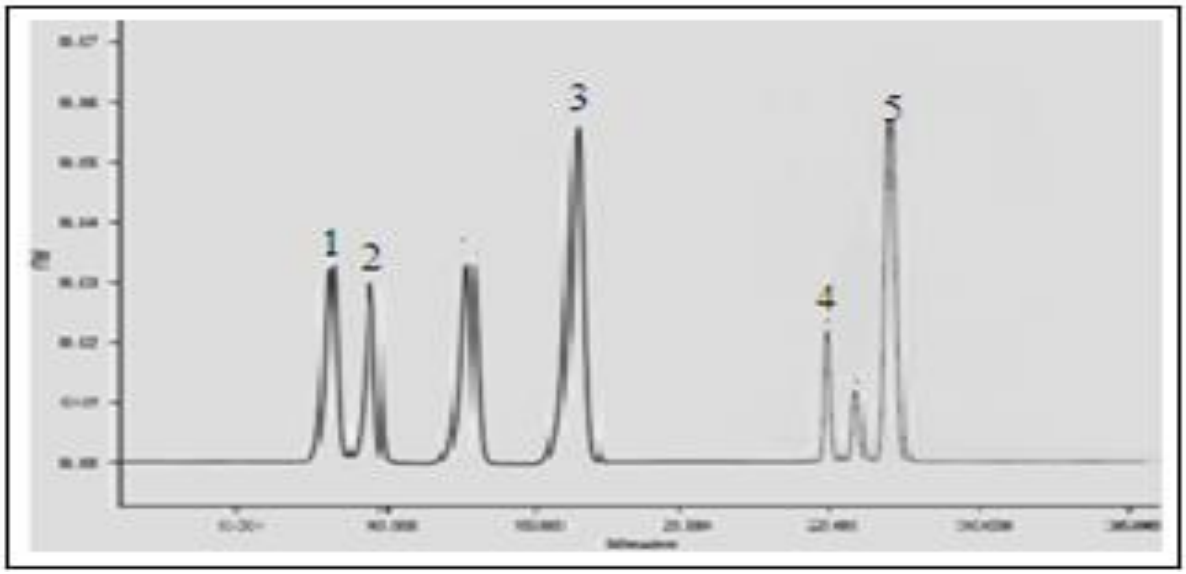

Fig. 4. Separation of five flavonoid in *S. multicaulis.*

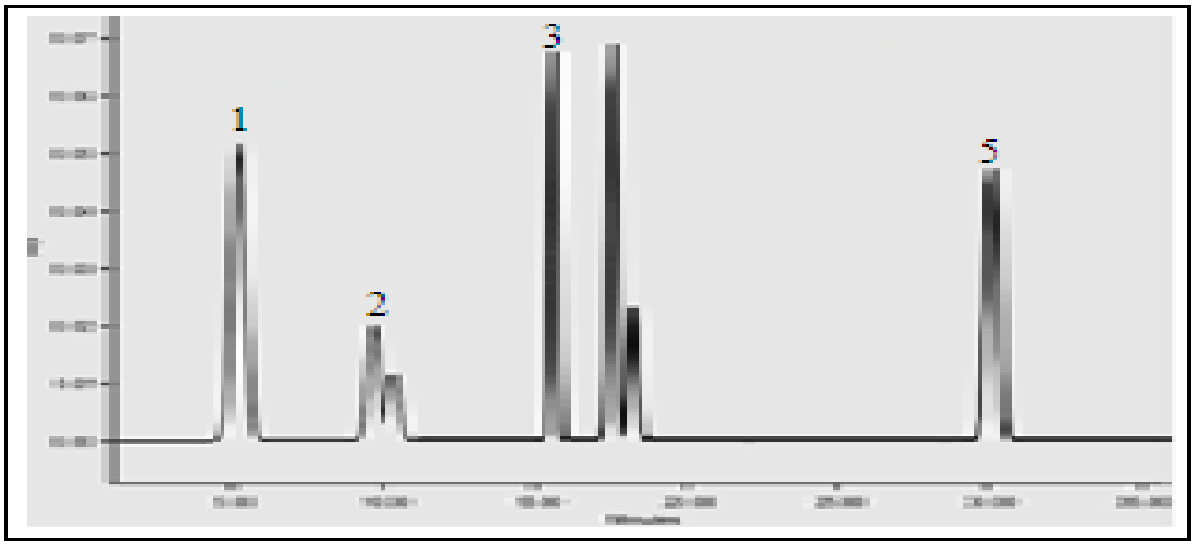

Fig. 5. Separation of four flavonoid in *S .pycnotricha.*

Flavonoids are the polyphenols, widely available in human diet, so it considered the products that include the structure C6-C3-C6 carbon framework of secondary metabolism of plants(Fig. 2). In this study we observed that the three species studied varied in their flavonoid content, The study included the identification of five flavonoids components in the species which there: kaempherol, isorhamnetin, isorhamnet in 3-glucoside,quercetin and rutin (Table 3), based on the standard compound which used in this study (Fig. 3). *S. multicaulis* has five compounds (Fig.4), while *S. pycnotricha*has four because it didn't has quercetin (Fig. 5), but the species *S .tomentosa* has three compounds, due to the *absence* of rutin and Isorhamnetin from its composition (Fig.6). In geographical study we found that the points of the

altitude for the species *S. multicaulis* ranged from 750m. to 2020m and for S. pycnotricha ranged from 650m to 820m but in *S. tomentosa* ranged from 850m to 1800m. The geographical distribution is due to the ability of the plant to spread and adapt it to the environmental conditions (Fig. 7),this agree with) and Taylor and Grotewold (2005). Frank *et al.* (2012) reported that the geographic information gives us a clear perception of plants.

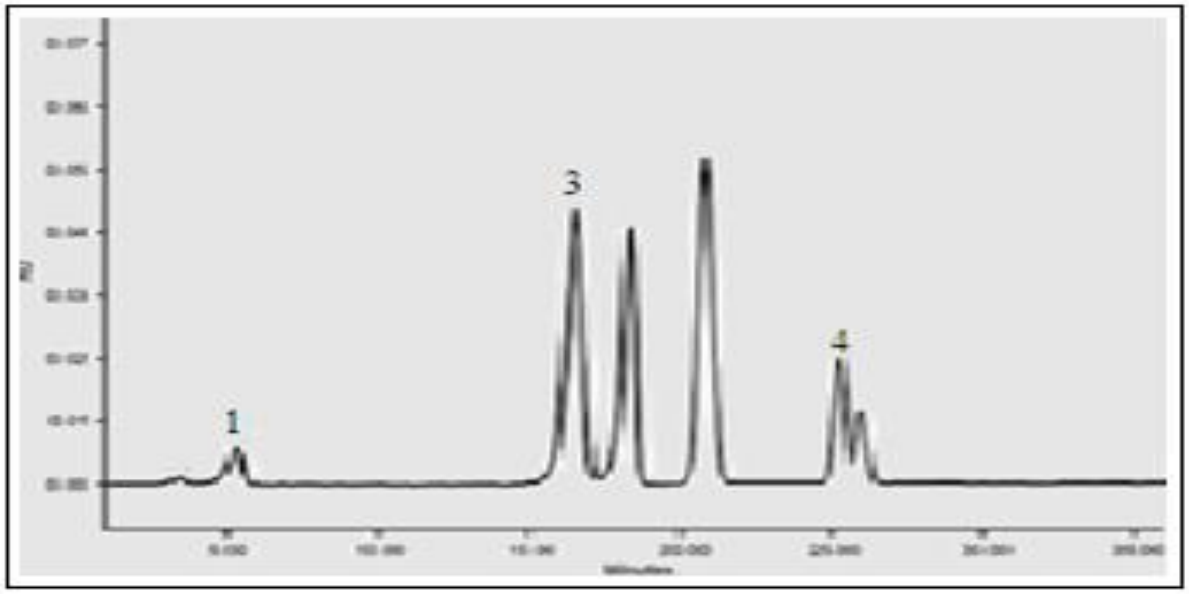

Fig. 6. Separation of three flavonoid in *S. tomentosa*.

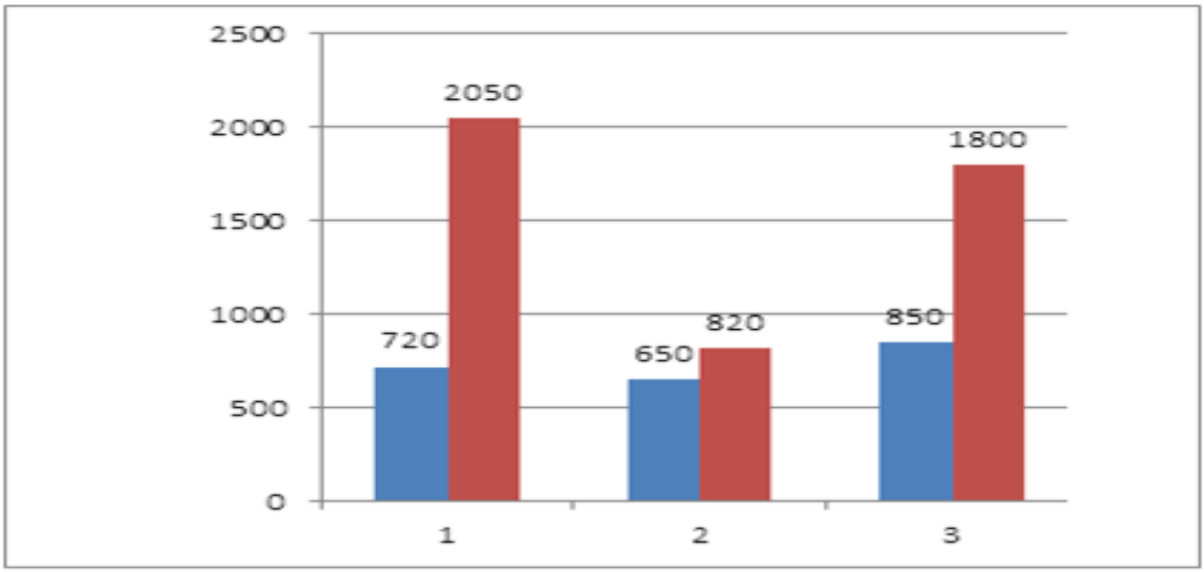

Fig. 7. Geographical distribution for the three species.

Conclusion

The identification and taxonomy of the Genus *Scutellaria* L. by the morphological, chemical and the geographical studies will provide useful characters which help us in taxonomic treatments of the genus.

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