

MORPHOLOGICAL, HISTOLOGICAL AND CHEMICAL STUDIES ON SOME TAXA OF GENUS VICIA

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ABSTRACT

The objectives of this investigation were to find out the remarkable morphological, histological and chemical differences among some wild taxa belong to genus *Vicia*, i.e., *V. narbonensis* var. *narbonensis*, *V. narbonensis* var. *salmonea* and *V. serratifolia* and the cultivated *V. faba* var. *minor*.

Morphological characters reveal that; *V. narbonensis* var. *narbonensis* and *V. narbonensis* var. *salmonea* are more or less similar on this respect but differs from *V. faba* var. *minor* or *V. serratifolia*. The latter is very distinguishable from both varieties of *V. narbonensis*. *V. faba* var. *minor* has a unique characters differ from the other taxa.

Studying the primary structure of root, stem and leaflet represents the histological differences among the wild taxa. The structure of the tap root (7 days old) presents remarkable differences in the types of vascular cylinder, being a triarch protostele in both varieties of *V. narbonensis*, tetrarch protostele in *V. faba* var. *minor* and pentarch protostele in *V. serratifolia*.

V. serratifolia has the thickest tap root with widest vascular cylinder, which occupies the pith area among the studied taxa. In addition, *V. serratifolia* has the largest diameters of xylem arms and number of xylem vessels, while phloem area do not differ in other taxa. The morphological results indicate also that the secondary roots are three in both varieties of *V. narbonensis*, four in *V. faba* var. *minor* and five in *V. serratifolia*.

The structure of the major and minor vascular bundles in the second stem internode below the shoot apex show that *V. faba* var. *minor* exceed all those of the other wild taxa.

The histological structure of the leaflet shows that *V. serratifolia* has a characteristic property showing the six vascular bundles of leaflet arranged in two rows in the mesophyll, while other wild taxa and *V. faba* var. *minor* have one bundle only.

Protein and non-protein amino acids results show slightly the same morphological results of taxa under investigation.

INTRODUCTION

Vicia is one of the most important genera among 650 genera belong to family *Fabaceae* which include 12000 species (Polhill and Raven, 1981). These species distributed throughout the north temperate regions and in South America (Kupicha, 1976).

Fabaceae is considered the second family to Poaceae importance to human food, economically, and animal feeds. It includes also forage and ornamental plants (Davis and Plitmann, 1969).

In general, the relationships among taxa based upon several taxonomic evidences, i.e., morphological (Alefeld, 1861, Mouterde, 1961, Schäfer 1973 and Plitmann, 1967) and chemical evidences (Harborne, 1973, Smith, 1976 and Bell, (1971, 1977 and 1981)). These evidences may provide

suitable and good picture to distinguish and relate among studied taxa. In addition, comparative anatomy that might provide facts concerning the structure of different organs of plant, (Cubero and Suso, 1981, Cubero, 1982 and Romsay *et al.* 1983).

This investigation was undertaken, firstly, to compare between wild and cultivated taxa of genus *Vicia* using certain morphological, histological and chemical characters. In addition, the primary structure of the different organs of the plants representing the taxa were investigated. The morphological comparison was concentrated, in addition to the taxonomic description of each taxon separately, on some major taxonomic characters differ among the studied taxa. The chemical comparison was focused only on the present or absent of some important protein and non-protein amino acids and secondly, to achieve the differences which might be of taxonomic importance.

MATERIALS AND METHODS

This study was carried out during 1999, on three wild taxa belonging to the genus *Vicia* namely; *V. narbonensis* var. *narbonensis*, *V. narbonensis* var. *salmonia*, *V. serratifolia* and one cultivated variety namely, *V. faba* var. *minor*. The materials for this study were divided into three groups:

- 1- Seeds of the wild taxa were provided by the Gene Bank of Biology Department, Southampton University, United Kingdom. The seeds of the cultivated taxon were obtained from the Agronomy Department, Faculty of Agriculture, Cairo University, Giza, Egypt.
- 2- The plants were grown from the above mentioned seeds in the field and green house of the Agricultural Botany Department, Faculty of Agriculture, Cairo University.
- 3- Herbarium specimens were loaned from the Royal Botanic Gardens, Kew (U.K.), British Museum (Natural History) (BM) U.K., Faculty of Science (Herbarium) Cairo University (CAI), Egypt and Desert Researches Center (CAIH), Cairo, Egypt.

The seeds were sown to provide materials for morphological, histological and chemical studies and to provide seeds for the gene bank.

The seeds were planted on 20th October 1999 in pots, 30 cm in diameter filled with Jiffy 7 peat pellets at 5 seeds per pot, and 5 pots per taxon. Five days later till the appearance of the radicle, specimens for histological study were taken from tap roots, stems, and leaflet lamina of plants taken at random from 3 pots and the other 2 pots were left to allow the plants to reach the maturity for morphological and chemical studies. In the field, seeds were sown in rows, 3 meter long with 55 cm between rows and 30 cm between plants in each row.

One week old, specimens of 1 cm long were taken from the middle portion of the tap root from 6 seedlings (two from each pot). Four weeks later, samples of the stems of 1 cm long of the second internode below the shoot apex and in addition, 1cm² samples from the middle of the leaflets lamina were taken. These samples were from 6 plants (two from each pot).

All samples were killed and fixed for at least 48 hours in F.A.A. (10 ml. Formalin, 5 ml. Glacial acetic acid and 85 ml. Alcohol), washed in 50 % alcohol, dehydrated in normal butyl alcohol and embedded in paraffin wax (56° C). Sections of 20 µ thick, were cut by using rotary microtome and stained with crystal violet/ erythrosin combination, cleared in xylene and mounted in Canada balsam (Willey, 1971).

Slides were microscopically examined and the measurements of different tissues were taken and averages of 10 readings were calculated. Photomicrographs were also taken.

The chemical methods used to separate and identify protein and non-Protein Amino Acids (NPAA) were:

- 1- High Voltage Paper Electrophoresis (H.V.P.E.) and
- 2- Two Dimension Paper Chromatography (2-D.P.C.). The extraction methods for H.V.P.E., were used according to Bell (1962) and Bell and Tirimanna (1965). While the extraction methods for Paper Chromatography were used accordingly Smith, (1969).

RESULTS AND DISCUSSION

Morphological aspects

Data score sheet which had been designed especially to show the variation patterns among different taxa within *Vicia*, contains some 60 characters (13 vegetative and 47 reproductive characters). Among these characters, the studied taxa were clearly different in 14 characters as being represents in Table (1).

Vegetative and reproductive characters were scored on healthy fresh plants from the field and green house and the herbarium specimens loaned from different herbaria mentioned earlier. Since scoring, the data were phenetic analysed using cluster analysis technique to achieve similarity or dissimilarity between studied taxa.

Morphological results reveal that *V. serratifolia* is considered a distinct species and not a variety of *V. narbonensis* which was in harmony with the results of Plitman, 1967, both varieties of *V. narbonensis* are more close to each other than to *V. serratifolia*. *V. faba var. minor*, as a cultivated taxon, is a distinct variety by its characteristics and can distinguished easily from the other wild taxa and the varieties of *V. narbonensis* are slightly close in some morphological characters to *V. faba var. minor*.

From the scoring sheet, the morphological descriptions of each taxon may be summarized as follows:

V. faba var. minor

Annual. Stem erect or ascending to procumbent, glabrous, 45-140 cm height. All leaves without tendrils, the rachis ending in mucro, 1-6 pairs of leaflets: leaflets 25-80 x 6-50 mm, ovate or obovate with acute, rounded and mucronate apex, glabrous, margins entire. Peduncle 10-35 mm long, 1-20 flowered. Stipules monorphic, semisagittate, glabrous with nectary present and translucent edge. Corolla large 20-40 mm in length. Calyx 4-10 mm long, green with equal erect teeth, glabrous.

Standard obovate with emarginate apex, glabrous, white with brown veins; wings white with distinct black - brown spot. Style dorsally compressed, linear apex with apical brush. Stigma apical-conical. Ovary with few hairs or glabrous, 2-8 ovules. Legume 50-150x6-12 mm, 2-6 per node, linear, glabrous with spongy tissues between seeds, black at maturity, circular in cross section. Seeds 10-40x8-20 mm, oblong or elongate, 2-10 per node smooth surface. Hilum linear or wedge - shaped, black, centre strip of hilum slightly dark (Fig.1, a).

V. narbonensis* var. *narbonensis

Annual. Stem erect or ascending, 40-100 cm height, sparsely hairy. Leaves 10-80 mm in length with branched tendrils, 1-4 pairs of leaflets; 10-50x5-40 mm, ovate with acute apex, entire-ciliate margins, sparsely hairy. Peduncle 2-10 mm long, 1-2 flowered. Stipule semisagittate or dentate, sparsely hairy. Corolla 18-24 mm in length. Calyx 5-15 mm long with erect teeth and hairs.

Standard pandurate with emarginate apex, glabrous, violetish with purple- violet veins. Wings violet without spot. Style laterally compressed, linear apex. Stigma conical. Ovary pubescent, 2-6 ovules. Legume 50-70 x 10-15 mm, 1-2 per node laterally compressed, sparsely to moderately hairy , ciliate at margins, dark brown at maturity. Seeds 5-9 x 6-10 mm, 4-6 per pods, spherical, dark- brown. Hilum oval, dark brown , centre strip of hilum white (Fig.1, b).

V. narbonensis* var. *salmonea

Annual. Stem erect, 6-30 cm in length, sparsely to moderately hairy. Leaves 10-50 mm long, 1-3 pairs of leaflets; 10-40 x 2-35 mm, obovate to ovate with rounded- mucronate apex, crenate or dentate margins, glabrous. Peduncle 2-6 mm long, 1-2 flowers. Stipules semisagittate, hairy. Corolla 15-20 mm in length. Calyx 5-10 mm long, hairy, erect and not equal.

Standard pandurate with mucronate apex, glabrous, violet with violet veins. Wings violet without spot. Style laterally compressed, linear apex. Stigma apical- conical. Ovary hairy, 2-5 ovules. Legume 30-50 x 5-10 mm, 1-2 pod per node, linear, hairy, yellow/ brown at maturity. Seeds 2-5 x 2-6 mm, 2-4 per pod, spherical, dark- brown. Hilum wedge-shaped, dark brown, centre strip of hilum white or beigeish (Fig.1, c).

V. serratifolia

Annual. Stem erect, 25-80 cm height, many branches at base of the plant, sparsely hairy. Leaves 25-80 mm, with branched tendrils. 1-4 pairs of leaflets; 6-50 x 5-30 mm, ovate with rounded- mucronate apex, sparsely hairy, upper leaflets with serrate margins, lower with entire margins. Peduncle 9-28 mm long, 5-7 flowers. Stipules semisagittate- dentate, hairy, stipule nectary dark grey. Corolla 15-25 mm in length. Calyx 8-12 mm long with equal, erect, hairy teeth. Calyx nectary purple.

Standard pandurate with emarginate apex, glabrous, dark violet with purple veins. Wings violet- purple with violet spot. Style dorsally compressed, linear apex, encircling hairs. Stigma apical- conical. Ovary hairy, 3-8 ovules. Legume 35-70 x 6-15 mm, 3-5 pods per node, linear, moderately hairy, dark

brown at maturity. Seeds 2-5 x 3-7 mm, 2-6 per pod, spherical, brown or red-brown. Hilum oval, dark brown, centre strip of hilum light brown (Fig.1, d).

The morphological descriptions of the studied taxa were used to achieve the key, the dendrogram (Fig.2) and the morphological summary (Table 1)

- 1- Leaf tip with a mucro 2
 Leaf tip with a tendril 2
- 2- Immature pods cylindrical ***V. faba var. minor***
 Immature pods laterally compressed..... 3
- 3- Wings without spot 4
 Wings with distinct spot 4
- 4- Leaflet margin dentate or entire 5
 Leaflet margin serrate ... ***V. serratifolia***
- 5- Centre strip of hilum white ***V. narbonensis var. narbonensis***
 Centre strip of hilum beige ***V. narbonensis var. salmonea***

Table (1): Some morphological characters differentiate among studied taxa

Taxa	<i>V.faba var.minor</i>	<i>V.narbonensis var. narbonensis.</i>	<i>V.narbonensis var salmonea</i>	<i>V. serratifolia,</i>
Characters				
Leaflet tip	with mucro	with tendril	with tendril	with branched tendril
Leaflet margin	Entire	entire-ciliate	dentate- crenate	serrate
Leaflet surface	Glabrous	sparsely hairy	glabrous	sparsely hairy
Stipule nectary	present with translucent edge	not aplicable	not aplicable	dark grey
Standard colour	white with brown veins	violetish with purple violet viens	violet with viole viens	dark violet with purple viens
Wing colour	White	violet	violet	violet- purple
Margin of calyx teeth	equal- erect	erect and not equal	erect and not equal	erect and equal
Wing spot colour	black- brown	without spot	without spot	violet
Legume sature	smooth- glabrous	sparsely to moderately hairy	hairy	moderately hairy
No. of seeds/ legume	2-10	4-6	2-4	2-6
Seed colour	black or dark brown	dark- brown	dark- brown	brown or red brown
Seed shape	oblong elongate	spherical	spherical	spherical
Hilum colour	Black	dark brown	dark brown	dark brown
Centre strip of hilum colours	slightly dark	white	white / beigeish	beige

Fig1(a+b

fig1(c+d)

fig2

Histological aspects

1- Structure of the root

The tap root is cylindrical in shape in all studied taxa. The number of rows of the secondary roots are three in (*V. narbonensis* var. *narbonensis* and *V. narbonensis* var. *salmonea*), four in (*V. faba* var. *minor*) and five in (*V. serratifolia*).

The primary structure of the root shows obvious differences between wild and cultivated taxa. The main root in all taxa has an uniseriate thin-walled epidermis followed by a cortex of irregular thin – walled parenchyma cells. The endodermis is the innermost layer of the cortex, where the casparian strips are hardly detected on the radial and cross walls of the endodermal cells. The number of cortex layers are 7-9, 8-10, 9-12 and 8-12 layers in *V. narbonensis* var. *salmonea*, *V. narbonensis* var. *narbonensis*, *V. serratifolia* and *V. faba* var. *minor*, respectively, and the cortex thickness are 399.7, 410.5, 549.5 and 351.6 μ in the same sequence. The vascular cylinder (stele) is surrounded by a region of cells which is termed the pericycle. It consists of 2-3 layers of thin-walled parenchyma cells.

The stele structures are triarch protostele type in both *V. narbonensis* var. *salmonea* and *V. narbonensis* var. *narbonensis*, pentarch protostele type in *V. serratifolia* and tetrarch protostele type in *V. faba* var. *minor*, which is in harmony with the description mentioned by El- Sahhar (1967) and Sayed and Abou-Bakr (1998) on *V. faba* (Fig. 3: a,b,c and d).

The diameters of the vascular cylinder (protostele) are 122.0, 117.2, 513.2 and 130.8 μ in *V. narbonensis* var. *salmonea*, *V. narbonensis* var. *narbonensis*, *V. serratifolia* and *V. faba* var. *minor*, respectively. The average numbers of vessels of xylem arm are 7- 11, 8-10, 29-33 and 6-9 in the same order, while the total numbers range between 18-30, 15-27, 90-130 and 25-35 in the same previous sequence. The length of xylem arms are 86.9, 68.3, 170.3 and 69.2 μ , while the widths are 35.8, 49.2, 89.9 and 35.1 μ , in the order stated before. While the phloem widths are 84.0, 101.0, 87.7 and 60.4 μ in the same order, respectively. The pith diameters are 76.2, 86.4 and 59.4 μ in *V. narbonensis* var. *salmonea*, *V. narbonensis* var. *narbonensis*, and *V. faba* var. *minor*, respectively, while in *V. serratifolia*, pith is absent, where the metaxylem vessels occupy the center of the root at this age, (Fig. 3, a,b,c and d) and (Table 2).

2- Structure of the stem

The second internode below the shoot apex in all examined taxa is short and quadrangular in outline in cross sections. There is a thin cuticle layer covering the epidermis, The epidermal cells are nearly square in shape in *V. narbonensis* var. *salmonea*, and *V. narbonensis* var. *narbonensis*, while they are square or tangentially elongated in *V. serratifolia* and are rarely elongated towards the cortex in *V. faba* var. *minor*. The whole diameters of the stem are 1554.4, 1538.0, 1650.0 and 2880.0 μ in *V. narbonensis* var. *salmonea*, *V. narbonensis* var. *narbonensis*, *V. serratifolia* and *V. faba* var. *minor*, respectively. The cortex consists of thin-walled parenchyma cells with small intercellular spaces, the outer 2-3 layers are chlorenchymatous underlying the epidermis, except at the corners where angular collenchyma is

Fig3(a+b)

fig3(c+d)

present. The innermost layer of the cortex contain starch grains , thus forming a starch sheath.

The number of cortex layers ranged between 8-14, 7-13, 7-14 and 10-14 and their thickness are 225.4, 242.0, 280.0 and 550.0 μ , in the same sequence. There are large major bundles locate opposite to the corners of the stem, with some minor ones, occupying the distance between each two major bundles.

The smaller bundles adjacent to the major bundles are larger than those, which are further. Moreover, two cortical bundles are located at two opposite corners of the stem. In the other corners, fibrous strands are detected. The procambium is still differentiating centrifugal phloem elements mostly parenchyma cells, and centripetal into xylem elements. The thicknesses of the vascular cylinder are 196.6, 209.0, 262.0, and 238.0 μ in *V. narbonensis* var. *salmonea*, *V. narbonensis* var. *narbonensis*, *V. serratifolia* and *V.faba* var.*minor*, respectively.

Table(2) : Measurements (μ) and counts of different tissues in cross sections of the main root of *V. serratifolia*, *V. narbonensis* var. *narbonensis*, *V. narbonensis* var.*salmonea* and *V. faba* var. *minor* (averages of 10 readings).

Taxa	<i>V.narbonensis</i> var. <i>salmonea</i>	<i>V.narbonensis</i> var. <i>narbonensis</i>	<i>V.serratifolia</i>	<i>V.faba</i> var. <i>minor</i>
Whole root diameter	1075.0	1146.5	1539.0	930.0
Cortex	399.7	410.5	549.5	351.6
Vascular cylinder	122.0	117.2	513.2	130.8
Pith	76.2	86.4	None	59.4
Xylem arm: Length	86.9	68.3	170.3	69.2
Width	35.8	49.2	89.9	35.1
Phloem width	84.0	101.0	87.7	60.4
Number of:				
Cortex layers	7-9	8-10	9-12	8-12
Xylem vessels	7-11	8-10	29-33	6-9

The lengths of major bundles are 190.2, 249.9, 270.9 and 525.0 μ , and their widths are 186.4, 154.7, 197.3 and 400.0 μ in the same order. The average number of xylem rows in major bundles are 5-8, 5-8, 6-9 and 8-12, and their average number of xylem vessels are 35-40, 24-32, 29-38 and 43-52, in the previous taxa, respectively. The lengths of minor bundles are 101.0, 133.0, 170.0 and 282.0 μ , and their widths are 135.2, 118.8, 122.0 and 173.5 μ in *V. narbonensis* var. *salmonea*, *V. narbonensis* var. *narbonensis*, *V. serratifolia* and *V.faba* var.*minor*, respectively.

The average number of xylem rows in minor bundles are 3-5, 3-5, 3-4 and 3-5 and their average number of vessels are 15-23, 13-20, 12-18 and 11-17, in the same order. The phloem thickness in major bundles are 111.0, 111.2, 100.2 and 130.0 μ , in the same previous order while in minor bundles are 50.0 μ in all species, except in *V.faba* var.*minor*, where it is 60.0 μ . The pith diameter measurements are 475.0, 446.6, 470.0 and 1198.0 μ , in the same sequence, (Fig.4; a,b,c and d), and (Table 3). The histological structure of the stem is in harmony with that mentioned by El-Sahhar (1967) and Sayed and Abou-Bakr (1998) on *V. faba*.

Fig4

fig4cont

Table (3): Measurements (μ) and counts of different tissues of the stem of *V.narbonensis* var.salmonea, *V.narbonensis* var.narbonensis *V.serratifolia* and *V.faba* var.minor (average of 10 readings).

Characters	Taxa	<i>V.narbonensis</i> var. <i>salmonea</i>	<i>V.narbonensis</i> . var <i>narbonensis</i>	<i>V.</i> <i>serratifolia</i>	<i>V.faba</i> var. <i>minor</i>
Whole stem diameter		1554.0	1538.0	1650.0	2880.0
Epidermis		44.0	40.0	50.2	60.0
Cortex		225.4	242.0	280.0	550.0
Vascular cylinder		196.6	209.0	262.0	238.0
Phloem: major bundles		111.0	111.2	100.2	130.0
Small bundles		50.2	50.0	50.0	60.0
Pith		475.0	446.6	470.0	1198.0
No. of cortex layers		8-14	7-13	7-14	10-14
Major bundles:					
Length		190.2	249.9	270.9	525.0
Width		186.4	154.7	197.3	400.0
No.of xylem: Rows		5-8	5-8	6-9	8-12
Vessels		35-40	24-32	29-38	43-52
Minor bundles:					
Length		101.0	133.0	170.0	282.0
Width		135.2	118.8	122.0	173.5
No.of xylem: Rows		3-5	3-5	3-4	3-5
Vessels		15-23	13-20	12-18	11-17

3- Structure of leaflet

Transections of the leaflet show that, the upper and lower epidermal layers are covered with thin cuticle. The thickness of the upper epidermal layer are 22.7, 27.2, 11.5 and 18.9 μ , while the lower ones are 41.0, 43.3, 11.7 and 14.9 μ , in *V. narbonensis* var. *salmonea*, *V. narbonensis* var.*narbonensis*, *V.serratifolia* and *V.faba* var.*minor*, respectively. Mesophyll thickness in the leaflets are 240.0, 254.0, 180.0 and 298.0 μ . The palisade tissue consists of two layers in all taxa, except in *V. serratifolia* where it is 5-6 layers and the spongy tissue is lacking, which differs from that stated by Metcalfe and Chalk (1950), El-Sahhar (1967) and Sayed and Abou-Bakr (1998) on *V.faba* (Fig.5,c).

Measurements of the palisade tissue thickness are 95.0, 100.0,180.0 and 109.0 μ , in *V.narbonensis* var. *salmonea*, *V.narbonensis* var.*narbonensis*, *V. serratifolia* and *V.faba* var.*minor*, respectively. The palisade tissue is extended through the midrib region, underlying the upper epidermis in all taxa, except *V.narbonensis* var.*salmonea* where parenchymatous cells are present.

Lengths of the midrib region are 230.9, 427.0, 1186.0 and 564.0 μ , while their widths are 444.4, 454.8, 1278.0 and 731.0 μ in *V. narbonensis* var. *salmonea*, *V.narbonensis* var.*narbonensis*, *V.serratifolia* and *V.faba* var.*minor*, respectively. In all species there is only one bundle in the midrib, except in *V. serratifolia* where six bundles in two rows are present. The average number of xylem rows in the midrib bundle are 3-5, 4-6, 6-8 and 4-7, and their average number of vessels are 8-12, 10-20, 16-32 and 12-22 , in *V. narbonensis* var.

fig cont

salmonea, *V. narbonensis* var. *narbonensis*, *V. serratifolia* and *V.faba* var.*minor*, respectively. In *V. serratifolia* there are tough multicellular uniseriate hairs on the upper and lower epidermis, opposite to the small bundles, which are embedded in parenchyma cells, extending from upper to lower epidermis, (Fig. 5: a,b,c and d) and (Table 4).

Table(4): Measurements (μ) and counts of different tissues in cross sections of the leaflet of *V. narbonensis* var. *salmonea*, *V. narbonensis* var.*narbonensis*, *V. serratifolia* and *V.faba* var.*minor* (averages of 10 readings)

Taxa	<i>V.narbonensis</i> var. <i>salmonea</i>	<i>V.narbonensis</i> var. <i>narbonensis</i>	<i>V.serratifolia</i>	<i>V.faba</i> var. <i>minor</i>
Upper epidermis	22.7	27.2	11.5	18.9
Lower epidermis	41.0	43.3	11.7	14.9
Lamina	303.0	330.0	206.0	335.0
Mesophyll	240.0	254.0	180.0	298.0
Palisade tissue	95.0	100.0	180.0	109.0
Spongy tissue	145.0	152.0	None	182.8
Length of midrib zone	230.9	427.0	1186.0	564.0
Width of midrib zone	444.4	454.8	1278.0	731.0
Midrib bundles:				
No. of xylem rows	3-5	4-6	6-8	4-7
No. of xylem vessels	8-12	10-20	16-22	12-22

Chemical analysis

Non-Protein Amino Acids (NPAAs) and their quantitative variations can be used as an evidence for taxonomic relationships within and among different categories, (family, genus, species...etc.). It is worthy to mention that, the term non-protein amino acids includes those naturally occurring amino acids and their amides which are not found as protein constituents (Bell, 1981).

Quantitative chemical results from Table (5) reveal that: *V.faba* var.*minor* as a cultivated variety is a very distinguish and differs from the other wild species by containing nearly all the protein and non protein amino acid compounds except Homoserine and Lysine. On the contrary, *V. serratifolia* lacks most of the protein and non- protein amino acid compounds, while Homoserine is detectable in the species.

On the other hand, *V.narbonensis* var.*narbonensis* and *V. narbonensis* var.*salmonea* are more close to each other and quite similar to *V.faba* var.*minor* than to *V. serratifolia*. The relationships among taxa obtained from the chemical results are in harmony with those from the morphological and histological results. It is worthy to mention that the geographical distribution of any plants may affected the precences or absence of any of the protein and non- protein amino acids in these plants, i.e. although Alinine could be detected in all seed samples of *V.faba* var.*minor* from Russa, it is absence in samples from Afghanistan. The same also occurred with samples of *V.narbonensis* var.*narbonensis* from Lebanon and samples of *V.narbonensis* var. *salmonea* from Syria. These results could be explain that the geographical distribution may control the quantities of substances in any organs side by side with the inheritance characteristic of these organs (Harborne, 1973).

Table (5): The distribution of some protein and non-protein amino acid compounds in seed extract samples of the studied taxa

Extract No.	Localety	Protein and N.P.A.A. compounds					
		Ala.	Arg.	Glut.	Asp.	Homo.	Lys.
1	Russia	+	+	+	+	-	-
2	Russia	+	+	+	+	-	-
3	Russia	+	+	+	+	-	-
4	Russia	+	+	+	+	-	-
5	Afghanistan	-	+	+	+	-	-
6	Italy	-	-	-	-	+	-
7	Italy	-	-	-	-	+	?
8	Italy	-	-	-	-	+	?
9	Greece	-	-	-	-	+	?
10	Frnce	-	-	-	-	-	-
11	Italy	+	+	+	+	-	-
12	Italy	+	+	+	+	-	-
13	Italy	+	+	+	+	-	-
14	Crete	+	+	+	+	-	-
15	Lebanon	-	-	-	+	-	?
16	Turkey	+	+	+	+	-	-
17	Turkey	+	+	+	+	-	-
18	Turkey	+	+	+	+	-	-
19	Syria	-	-	-	+	+	?
20	Turkey	+	+	-	-	+	?

1-5: *V. faba* var. *minor* 6-10: *V. serratifolia*, 11-15: *V. narbonensis* var. *narbonensis*

16-20: *V. narbonensis* var. *salmonia*

(+): present (-): absent (?): Not applicable

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دراسات مورفولوجية وتشريحية وكيميائية على بعض الفئات التصنيفية من جنس *Vicia*

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تهدف هذه الدراسة الى اظهار الاختلافات المورفولوجية و التشريحية و الكيميائية بين بعض الفئات التصنيفية البرية من جنس *Vicia* : *V.narbonensis* var. *salmonia*, *V.narbonensis* var. *narbonensis*, *V.serratifolia*, *V.faba* var. *minor* بالإضافة الى النوع المزروع *V.*

وقد أظهرت الدراسات المورفولوجية و الكيميائية ان:

١- النوعين *V.narbonensis* var. *salmonia* and *V.narbonensis* var. *narbonensis*

اكثر تشابها لبعضهما البعض عن الانواع الاخرى

٢- النوع *V. serratifolia* متميز بصفات مختلفة ومستقلة عن بقية الانواع المدروسة ولا يعتبر احد اصناف *V.narbonensis*

٣- النوع المزروع *V.faba* var. *minor* مشابه الى حد ما في بعض الصفات المدروسة مع الصنفين/نوع *V. serratifolia* و يختلف تماما عن النوع *V. serratifolia*

برهنت النتائج المورفولوجية للجذر على وجود اختلافات في عدد صفوف الجذور الثانوية بين الانواع البرية و النوع المزروع حيث كان عدد الصفوف ثلاثة في النوعين البريين *V. narbonensis* var *salmonia* و *V. narbonensis* var *narbonensis* , اربعة في النوع المزروع *V.faba* var. *minor* بينما كان عدد الصفوف خمسة في النوع البري *V.serratifolia* وبدراسة التركيب التشريحي للجذر الاصلى عمر اسبوع ظهرت اختلافات في عدد الحزم القطرية حيث كانت ثلاثية أذرع الخشب في النوعين الاول و الثانى و رباعية في النوع المزروع و خماسية في النوع البري الثالث. و قد كان سمك الاسطوانة الوعائية في النوع البري *V. serratifolia* تقريبا اربعة امثال الانواع الاخرى. احتل الخشب مركز القطاع ولهذا كانت اذرع الخشب أطول و أعرض وأكثر في عدد اوعية الخشب عن نظيراتها في الانواع الاخرى بينما لم تختلف أبعاد اللحاء كثيرا بين الانواع المدروسة.

اظهر التركيب التشريحي للساق في السلامة الثانية العلوية في النباتات عمر اربعة اسابيع ان النوع المزروع كان الاكثر سمكا حيث بلغ ضعف السمك الموجود في الانواع البرية الثلاثة و شمل ذلك سمك البشرة و القشرة و الاسطوانة الوعائية و النخاع. و بالنسبة للحزم الكبيرة و الصغيرة بالساق فقد كانت ايضا هي الاعلى في قياستها عن الاخرين.

اظهرت قياسات الوريقة ان النصل في النوع البري *V. serratifolia* اقل في السمك عن بقية الانواع تحت الدراسة و كان ذلك بسبب نقص قياسات الانسجة كال البشرة العليا و السفلى و سمك الميزوفيل المتكون من ٥-٦ طبقات من النسيج العمادي فقط و غياب النسيج الاسفنجي. على العكس فقد كان هذا النوع الاعلى قياسا بالنسبة لسمك و عرض منطقة العرق الوسطي وكان بالعرق الوسطي ٦ حزم وعائية في صنفين اما الانواع الاخرى فكان بها حزمة واحدة.

Fig. (1): Photograph showing the morphological structure of studied taxa in genus *Vicia*.

- a)** *V. faba var. minor*. Note: the mucronate apex of leaflets
- b)** *V. narbonensis var. narbonensis*. Note: without mucro

Fig. (1 cont.): Photograph showing the morphological structure of studied

taxa in genus *Vicia*.

c) *V. serratifolia* Note: serrate leaflets

d) *V. narbonensis* var. *salmonea* Note: crenate leaflets

- Fig.(3): Transection in main root of 7 days old seedlings of studied taxa
in the genus *Vicia*. (X 100)
- a) *V. narbonensis* var. *salmonia*
b) *V. narbonensis* var. *narbonensis*

- Fig.(3 cont.): Transection in main root of 7 days old seedlings of studied taxa**
- a) in the genus *Vicia*. (X 100)**
- V. serratifolia***
- d) *V. faba var.minor***

Fig.(4): Transections in the second internode, below the shoot apex of four weeks old plants, of studied taxa in the genus *Vicia*. (X 40).

a) *V. narbonensis* var. *salmonea*

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b)V. narbonensis var. narbonensis

Fig.(4 cont.): Transections in the second internode, below the shoot apex of four weeks old plants, of studied taxa in the genus *Vicia*. (X 40).
c) *V. serratifolia*
d) *V. faba var.minor*

Fig. (5): Transections of the leaflet of studied taxa in the genus *Vicia* (X 40).

- a) *V. narbonensis* var. *salmonea***
- b) *V. narbonensis* var. *narbonensis***

Fig. (5 cont.): Transections of the leaflet of studied taxa in the genus *Vicia*

- (X 40).
c) *V. serratifolia*
d) *V. faba var. minor*