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Taxonomy and nomenclature of *Camelina pilosa* auct.

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Abstract

It was found when examining typical herbary material that *Camelina sativa* α *pilosa* DC. is a synonym of *C. microcarpa* Andrz. subsp. *silvestris* (Wallr.) Hiit. and *C. pilosa* (DC.) Zing. (=*C. sativa* (L.) Cr. subsp. *pilosa* (DC.) Zing.) belongs to *C. sativa* (L.) Cr. s.l. Therefore the name of *C. pilosa* (DC.) Zing. as based on the alien type should be rejected and the author suggests in its place the name of *C. sativa* (L.) Cr. var. *Zingeri* Mirek var. *nova*.

INTRODUCTION

Thanks to Zinger's already classical works (1908, 1909) and those of his successors (Tedin, 1925; Sinskaya, 1928; Sinskaya, Bestuzheva, 1931; Vassilčenko, 1939; Hiitonen, 1948; Meikle, 1964; Smejkal, 1971) the main taxonomical and terminological problems concerning European species of the genus *Camelina* seemed to have been explained. Zinger's conception, slightly modified by Hiitonen (1948), Meikle (1964), and others is represented — in relation to European taxa — by a system adopted in the latest monographic elaboration of the genus *Camelina* from Czechoslovakia (Smejkal l. c.). This system is as follows:

Camelina microcarpa Andrz.	subsp. *microcarpa*
	subsp. *silvestris* (Wallr.) Hiit.
Camelina sativa (L.) Cr.	subsp. *pilosa* (DC.) N. Zing.
	subsp. *sativa*
Camelina alyssum (Mill.) Thell.	subsp. *alyssum*
	subsp. *integerrima* (Čelak.) Smejkal

This scheme shows a sequence of variability from *Camelina microcarpa* subsp. *microcarpa* through *C. sativa* to *C. alyssum*. Among the listed taxa, *C. sativa* subsp. *pilosa* is, the most controversial and enigmatic until now. This taxon was distinguished by De Candolle (1821) but the West-European and Russian authors adopted its characteristics after Zinger (1908, 1909) and Vassilčenko (l.c.), since De Candolle's description had been too concise to be sufficient. While some authors (Meikle l.c.) consider *C. pilosa* to be only a pilose form of *C. sativa* of little taxonomic significance, others (Zinger l.c., Sinskaya l.c., Vassilčenko l.c., Smejkal l.c.) regard it as a quite outstanding taxon and treat it as a species or subspecies.

The latter authors follow Zinger in claiming that *C. pilosa* clearly takes an intermediate position between *C. sativa* subsp. *sativa* and *C. microcarpa* subsp. *silvestris*, yet it is closer to *C. sativa* and they usually distinguish this taxon as a subspecies within *C. sativa* s.l. This intermediate position of *C. pilosa*, mentioned in the literature, is well-rendered in the Table 1.

Table 1

Ranges of characters of *Camelina pilosa* and related taxa, according to literature

Character	Species	Vassilčenko 1939	Smejkal 1971
Length of seeds (mm)	*C. silvestris*	1.2-1.5	1.2-1.5 (1.6)
	C. pilosa	1.2-1.8	1.2-1.6 (1.8)
	C. sativa s. str.	1.5-2.0 (2.5)	1.5-2.0 (2.5)
Length of fruit (mm)	*C. silvestris*	5-7 (8)	(5) 6-7 (7.5)
	C. pilosa	8-12	(5) 6-7 (8)
	C. sativa s. str.	7-10 (12)	(6) 7-9 (10)

Apart from the intermediate position of *C. pilosa*, it is also important to note that, the ranges of values of each feature of the species overlap the ranges of values of the corresponding features of *C. sativa* subsp. *sativa*, and *C. microcarpa* subsp. *silvestris*, thus complicating the clear distinction of *C. microcarpa* from *C. sativa*..

The biometrical and literature studies conducted by the author throw new light on the taxonomic position and nomenclature of *C. pilosa*.

MATERIAL

The paper is based on biometrical studies of herbarium materials. The majority of materials come from the Polish herbaria, some from the Leningrad herbarium (LE), the original materials revised by Zinger, and the original material of *C. sativa a pilosa* DC. from De Candolle's

Genevan herbarium (G DC). Specimens with well-developed, ripe seeds were the only ones taken into account. The lengths of petals and sepals were measured after soaking them in lukewarm water. Morphological relations between taxa were calculated using clustering method (S o k a l, S n e a t h, 1963).

RESULTS AND DISCUSSION

POSITION OF *CAMELINA PILOSA* SENSU ZINGER WITHIN THE GENUS *CAMELINA*

It has been found biometrically that (contrary to the earlier data from the literature) *C. microcarpa* s.l. can be easily distinguished from *C. sativa* s.l. both on the basis of a pair of characters (Fig. 1) and on the basis of a greater number of them (Fig. 2). The question arose then, where should *C. pilosa* sensu Zinger been classified if its range, according to the above authors, overlaps *C. sativa* s.l. on one side and *C. microcarpa* s.l., on the other.

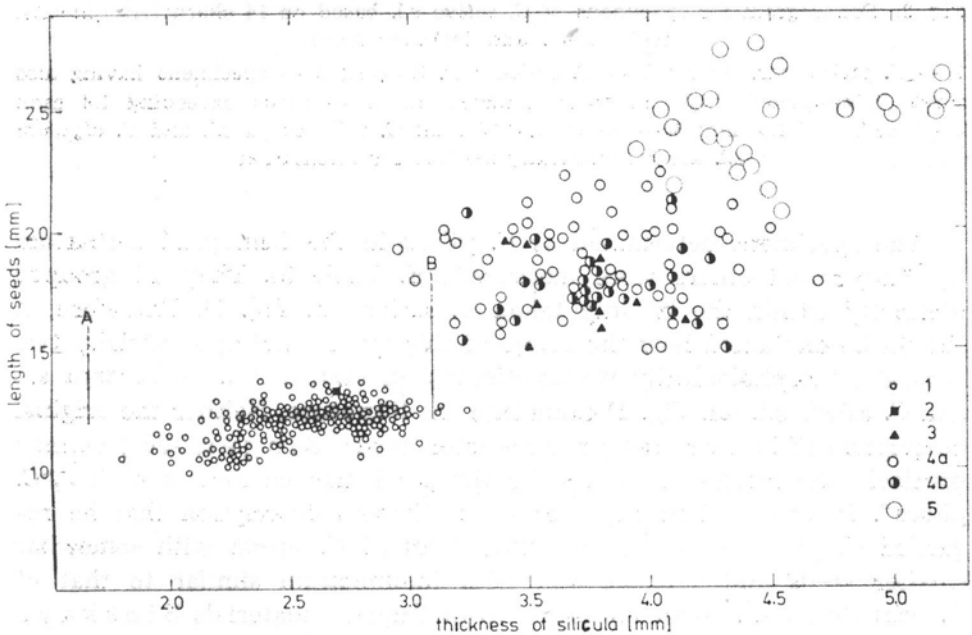

Fig. 1. Scatter diagram of the examined specimens of *Camelina* (from Europe and Asia) for the characters: length of seeds x thickness of silicula

Designations: 1 — *Camelina microcarpa* s.l. (incl. *C. microcarpa* s.str. and *C. silvestris* s.str.); 2 — specimen determined by De Candolle as *C. sativa* α *pilosa*; 3 — specimens determined by Zinger and other Soviet authors as *C. pilosa*; 4 — *C. sativa* s.l. (incl. *C. sativa* s.str. and *C. pilosa* sensu Zinger): a — specimens without single (unbranched) hairs, b — specimens having also single hairs in their indumentum; 5 — *C. alyssum* s.l. (incl. *C. alyssum* s.str. and *C. macrocarpa* Wierzb. ex Reichnb. = *C. alyssum* subsp. *integerrima* (Čelak.) Smejkal). A — range of length of seeds (acc. to S m e j k a l l.c. and V a s s i l č e n k o l.c.) of *C. microcarpa* Andrz. subsp. *silvestris* (Wallr.) Hiit. (= *C. silvestris* Wallr.); B — range of length of seeds of *C. pilosa* (*C. sativa* subsp. *pilosa* (DC.) Zing.) (acc. to S m e j k a l l.c. and V a s s i l č e n k o l.c.)

My studies, however, included only specimens with well-developed, ripe seeds. Additionally, the research included measurements of the siliculae thickness (character not examined metrically by any of the previous authors) which, apart from the length of seeds, has been found the best to distinguish clearly *C. microcarpa* s.l. from *C. sativa* s.l.

NOMENCLATURE

Distinguishing *C. pilosa* Zinger identified it with the taxon already described by De Candolle. Zinger's interpretation, however, arouses some doubts if we carefully consider the information given by De Candolle in his "*Regni Vegetabilis Systema naturale*" (1821) in respect of both *C. sativa α pilosa* and the other taxa of this genus. They are as follows:

1. While describing *C. sativa α pilosa*, De Candolle points out that it is a taxon growing wild ("*semper silvestris*"), contrary to the typical form of *C. sativa β glabrata*. On the other hand, Zinger claims that his *C. pilosa* is a winter-annual and pilose from of *C. sativa* quite often cultivated and, growing as a weed.

2. In the group of *C. microcarpa*, De Candolle mentions only *C. microcarpa* Andrz., by which — as may be concluded from the distribution assigned to this taxon: "*in Podolia*" — he meant only *C. microcarpa* Andrz. s. str., without *C. silvestris* Wallr. It suggests that *C. silvestris*, which is relatively frequent in Central and a large part of Western Europe was unknown to De Candolle, which is highly improbable.

The facts listed above suggest that the name of *C. sativa α pilosa* DC. referred to *C. silvestris* Wallr. (a taxon included in *C. microcarpa* s.l.). This assumption seems to be confirmed by the fact that De Candolle gave the name of *C. silvestris* Wallr. as a synonym for his *C. sativa α pilosa*. Since then this fact and others mentioned above, have been neglected by later authors.

It is clear that Zinger by adopting the name of *C. sativa α pilosa* DC. for the taxon distinguished by himself, i.e. *C. pilosa* sensu Zinger, interpreted incorrectly De Candolle's taxon. It could easily happen as:

a. De Candolle described his taxon very concisely,

b. he distinguished it as a variety within *C. sativa*,

c. Zinger did not see De Candolle's typical material.

The discussed problem was fully solved by the measurements of the authentic *C. sativa α pilosa* DC. In De Candolle's Genevan herbarium (G DC) there are four sheets of this taxon collected before the year 1821 (the year of publication Reg. Veg.-Syst. Nat. 2) and determined by De Candolle as *C. sativa α pilosa*. Among these four sheets, there is only one which contains a specimen with well-developed and ripe seeds. The copy of the label from this sheet and numerical values of the particular

Table 2

Characters of *Camelina pilosa* sensu Zinger and auct. Fl. Ross.

Number	Length of fruit in mm	Breadth of fruit in mm	Thickness of fruit in mm	Length of seeds in mm	Number of seeds in a fruit	Length of sepals in mm	Length of petals in mm	Relative thickness of hairs	
								stem	leaves
1[z]	10.5	5.3	3.9	—	19	—	—	—	—
2[z]	9.6	5.3	3.8	1.85	18	3.07	4.10	2	1.5
3[z]	9.7	5.5	3.5	1.92	16	—	—	3	2.5
4[z]	9.1	5.5	3.4	1.95	14	—	—	2	2
5	8.3	5.0	3.4	—	22	2.88	4.15	2	1.5
6[z]	8.1	4.9	3.7	1.64	18	—	—	2	1.5
7[z]	8.1	5.5	4.2	—	15	—	—	—	—
8	8.1	5.3	3.8	1.55	19	2.69	3.80	3	2
9	8.0	4.8	3.7	—	14	—	—	—	—
10	7.1	4.9	3.9	1.58	19	—	—	2	3
11	7.1	4.7	3.3	1.67	19	—	—	3	2
12[z]	6.7	5.0	4.0	—	—	—	—	2	3
13[z]	6.4	4.7	3.7	—	10	2.98	4.62	2	2
14	6.4	4.7	3.5	1.50	21	—	—	2	—

All specimens came from various regions of the European part of the USSR. Well developed but not ripe seeds are marked with asterisk. The letter "z" denotes that a specimen has been determined by Zinger while the remaining ones by other Soviet taxonomists.

My studies, however, included only specimens with well-developed, ripe seeds. Additionally, the research included measurements of the siliculae thickness (character not examined metrically by any of the previous authors) which, apart from the length of seeds, has been found the best to distinguish clearly *C. microcarpa* s.l. from *C. sativa* s.l.

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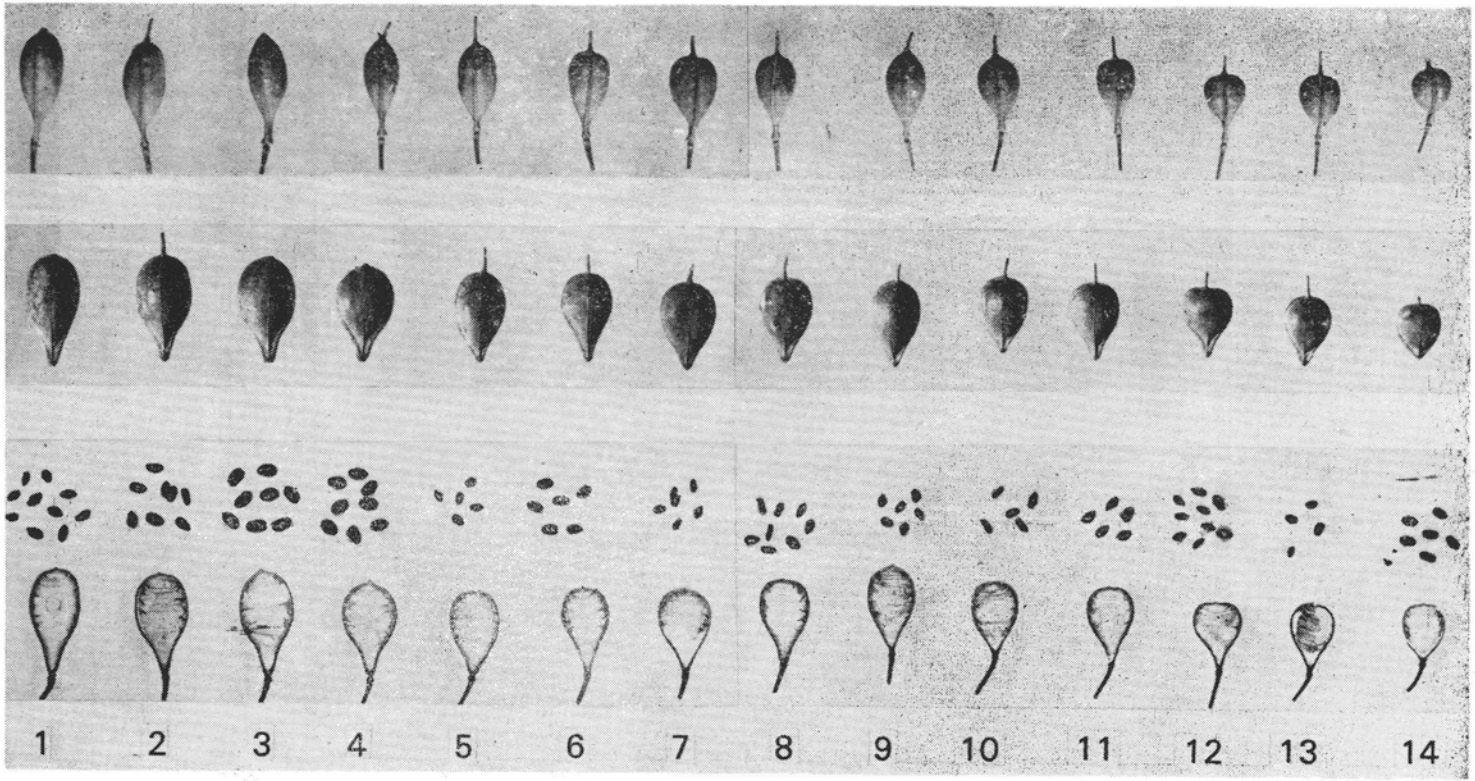

Fig. 3. The siliculae (two upper rows) and seeds with membraneous false septum (beneath) of *Camelina pilosa* sensu Zinger and auct. Fl. Ross.
The numbering of specimens corresponds to that in Table 2

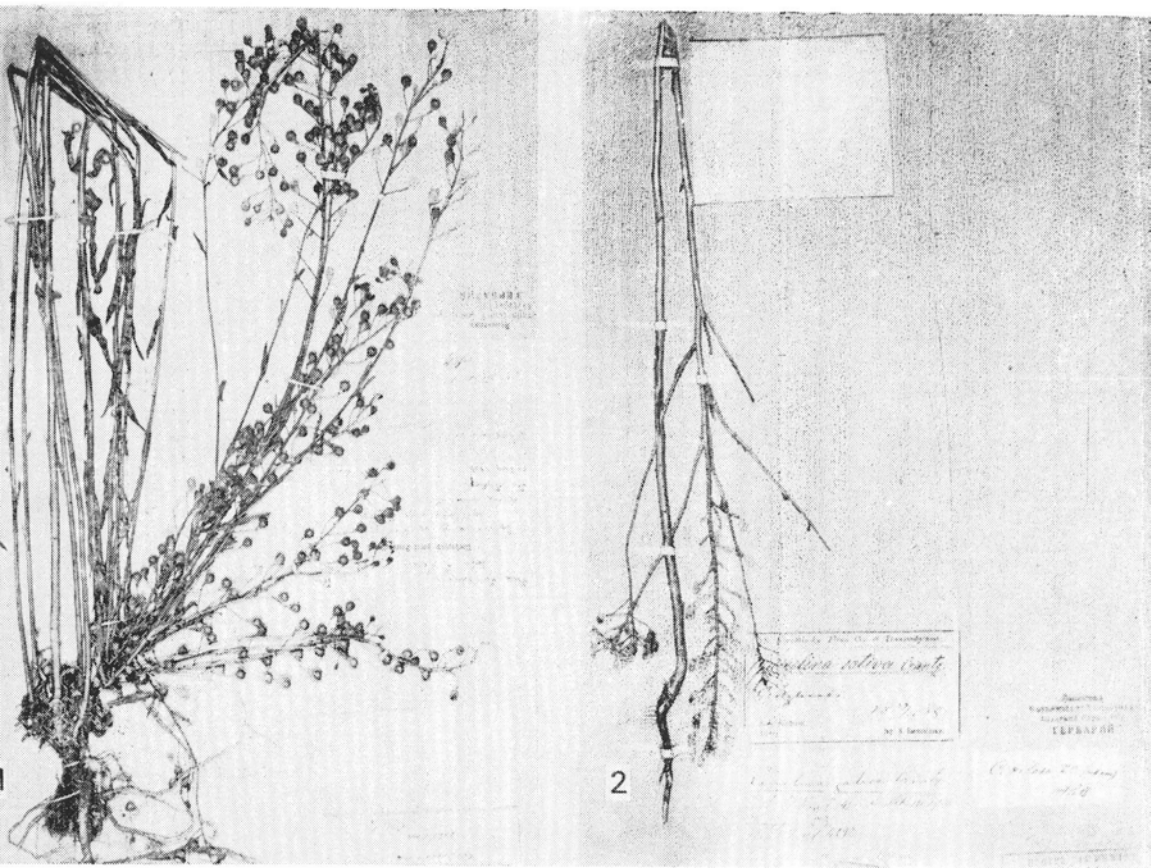

Fig. 4. *Camelina sativa* (L.) Crantz var. *Zingeri* Mirek var. *nova*.
1 — specimen selected as type of the taxon (corresponds to number 12 in Fig. 3 and Table 2); 2 — another specimen of this taxon (corresponds to number 14 in Fig. 3 and in Table 2)

characters of the specimen in question are given below: "*Myagrum paniculatum (delet.) satvum L. Ad marginem agrorum circa Anspach legi,... Juni 1809 (manu ignota)*" (in G DC). Characters of the specimen:

length of seeds — 1.33 mm (mean 4 measurements)
length of silicula — 6.9 mm (one measurement)
width of silicula — 4.4 mm (one measurement)
thickness of silicula — 2.7 mm (one measurement).

Numerical values of this specimen and its position in the scatter diagram (Fig. 1) confirm fully the assumption that *C. sativa α pilosa* DC. represents the taxon *C. microcarpa* Andrz. subsp. *silvestris* (Wallr.) Hiit. (= *C. silvestris* Wallr.) and, differs distinctly from *C. pilosa* sensu Zinger (a taxon classified to *C. sativa* s.l.).

TAXONOMIC INDIVIDUALITY OF *CAMELINA PILOSA* SENSU ZINGER

Since the position along with the terminological problems of Zinger's *C. pilosa* seem to be clear, its individuality within *C. sativa* s.l. may now be analysed. As seen from the diagram in Fig. 1, specimens of Zinger's *C. pilosa* as well pilose specimens are scattered over almost the entire area of variability of *C. sativa,* though, according to Zinger, most of them have fruits and seeds smaller than those found in other specimens of *C. sativa.* A complex formulation of the variability of *C. sativa* s.l. (cf. Fig. 2) indicates that pilose specimens and specimens with smaller fruits and seeds are grouped together and should be distinguished as a separate taxon. However, since the analysis of more extensive material (Mirek, in press) indicates at the same time the existence of numerous transitional forms, it is proposed to distinguish this taxon as another variety.

The name of *C. sativa* subsp. *pilosa* (DC.) Zinger should be rejected, as based on the alien type, and the author suggests to replace it with the name of *C. sativa* (L.) Crantz var. *Zingeri* Mirek var. *nova.*

CAMELINA SATIVA (L.) CRANTZ VAR. *ZINGERI* MIREK VAR. *NOVA*

A C. microcarpa Andrz. (s.l.) differt seminibus majoribus 1.5-1.8 (1.95) mm longis, nec non siliculis crassioribus, 3.2-4.3 mm crassis.
A C. sativa var. sativa notis his distinguitur: " Planta saepissime subbiennis, autumno germinans (non stricte annua, vere germinans, ut var. sativa forma typica). Indumentum foliorum paginae superioris atque caulis non solum e pilis ramificatis sed etiam e pilis simplicibus (non ramificatis) multis compositum. Siliculae in var. Zingeri formis typicis late pyriformes (nec, ut in var. sativae formis typicis oblongo-pyriformes); preaterae siliculae seminaque var. Zingeri parum minores sunt quam var. sativae".

Typus: The specimen collected in the environs of Leningrad in 1883 by R. Regel. Determined by Zinger as "*C. pilosa* DC. (pro var)". (Fig. 4). The sheet, is preserved in the Leningrad herbarium (LE).

Syn: *C. sativa* subsp. *pilosa* auct. non DC.: Zinger in sched. Herb. fl. Ross. 6: 141 (1908); Vassilčenko in Flora USSR 8: 600 (1939), p.p.; Smejkal in Preslia (Praha) 43: 327 (1971) p.p. Other synonyms and detail descriptions of *C. sativa* Cr. var. *Zingeri* Mirek and *C. microcarpa* Andrz. subsp. *silvestris* (Wallr.) Hiit. are given in another paper (Mirek, in press).

DISTRIBUTION AND CONDITIONS OF OCCURRENCE

Specimens of this taxon are generally found over the whole area of occurrence of *C. sativa*, but particularly often in the Eastern and some parts of South-Western Europe. Previously frequently cultivated, at present more rarely; moreover as a segetal and ruderal weed. As it seems, it is a dying out taxon.

CRITICAL COMMENTS

This taxon, particularly its individuality within *C. sativa* s.l. needs futher studies. It is still argued in how much the character of "bienniality", very difficult to determine on herbarium material, is correlated with other characters of this taxon. It should also be stressed that single (unbranched) hairs usually occur abundantly in *C. sativa* var. *Zingeri* in contrast to *C. sativa* var. *sativa* in which they also occur sometimes but they are scarce.

Acknowledgments

Thanks to the courtesy of Prof. Burdet I have received accurate data on the typical material of *C. sativa α pilosa* from De Candolle's Genevan herbarium (G DC). I am also grateful to Dr. T. Tacik for discussing terminological problems. I express my thanks to Dr. R. Sutter and Dr. K. Ammann from Bern for their help during my work.

REFERENCES

De Candolle A. P. 1821. Regni vegetabilis systema naturale, ... Paris pp. 745.

Hiitonen I. 1948. Blick auf die Camelina-Arten Finnlands. Arch. Soc. Zool. Bot. Fenn. Vanamo 1 (1946): 129-131.

Meikle R. D. 1964. *Camelina* Crantz. In: Tutin T. G. et al. (ed.) Flora Europaea 1 p. 315, Cambridge, Cambr. Univ. Press.

Mirek Z. 1980. The genus *Camelina* in Poland — taxonomy, distribution and habitats. Fragm flor. geobot. 26 (in press).

Sinskaya E. N. 1928. Masličnye i korneplody semejstva *Cruciferae*. Trudy Prikl. Bot. 3: 535-554.

Sinskaya E. N., Bestuzheva A. A. 1931. The forms of *Camelina sativa* in

connection with climate, flax and man. Bull. Appl. Bot. Gen. Pl.-Breed. 25: 98-200.

Smejkal M. 1971. Revision der tschechoslowakischen Arten der Gattung *Camelina* Crantz (*Cruciferae*). Preslia 43: 318-337.

Sokal R. R., Sneath P. H. A. 1963. Principles of numerical taxonomy. San Francisco a. London, W. H. Freeman, pp. 359.

Tedin O. 1925. Vererbung, Variation und Systematik in der Gattung *Camelina*. Hereditas 6: 275-386.

Vassilčenko I. T. 1939. *Camelina* Crantz. In: Flora USSR. Ed. V. L. Komarov. Moskva, AN SSSR. 8: 596-602.

Zinger N. 1908. *Camelina sativa* Crantz. Sched. Herb. Fl. Ross. Sanktpeterburg 5 (No. 1201-1600): 124.

Zinger N. 1909. O zasorjajuščich posevy lna vidach *Camelina* i *Spergula* i ich proischoždenii. Trav. Mus. Bot. Ac. Imper. Sci. St.—Petersbourg 6: 1-303.

Taksonomia i nomenklatura Camelina pilosa auct.

Streszczenie

W pracy wyjaśniono pozycję i zakres zmienności enigmatycznego taksonu *Camelina pilosa* (DC.) Zing. (= *C. sativa* (L.) Cr. subsp. *pilosa* (DC.) Zing.). *Camelina pilosa* w dotychczasowym ujęciu (por. tab. 1 i fig. 1) była jednostką w sztuczny sposób łączącą w sobie część zmienności *C. microcarpa* subsp. *silvestris* z jednej, oraz część zmienności *C. sativa* z drugiej strony. W toku badań stwierdzono, że *C. pilosa* sensu Zinger należy do zakresu zmienności *C. sativa*, natomiast zbadany oryginalny materiał tego taksonu (*C. sativa α pilosa* DC.) z genewskiego zielnika De Candolle'a reprezentuje *C. microcarpa* subsp. *silvestris*. Wobec tych faktów, nazwę *C. pilosa* (DC.) Zing. jako opartą na obcym typie odrzucono, a w jej miejsce dla wyróżnionego w randze odmiany taksonu zaproponowano nazwę *C. sativa* var. *Zingeri* Mirek var. *nova*. Nazwę zaś *C. sativa* (L.) Cr. (var.) *α pilosa* DC. włączono w poczet synonimów *C. microcarpa* subsp. *silvestris*.