

ON THE OCCURRENCE OF TULIPOSIDES IN THE LILIIFLORAE

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Key Word Index—*Alstroemeriaceae*; *Liliaceae*; Relationships among *Liliiflorae*; allergenic plant constituents; post-inhibitins; tuliposides; chemotaxonomy.

Abstract—Approximately 200 samples of liliiflorous plants were investigated for the presence of tuliposides. Appreciable amounts of tuliposide A were detected in all species of *Erythronium*, *Tulipa*, *Gagea*, *Bomarea* and *Alstroemeria*. Large amounts of tuliposide B seem to be restricted to *Erythronium* and *Tulipa*. The occurrence of identical post-inhibitins in *Tulipa* and allied taxa and in *Alstroemeria* and allied taxa is interpreted as indicating a close relationship between *Lilioideae* and *Alstroemeria-ceae*. At the same time the allergenic potentialities of all taxa of *Alstroemeria* are stressed.

INTRODUCTION

Tuliposide-A, the ester of glucose with α -methylene- γ -hydroxybutyric acid, occurs in large amounts in tulips. It is accompanied by tuliposide-B, the β -hydroxyderivative of the former [1]. The hydroxy-acids released by enzymic or spontaneous hydrolysis of tuliposides lactonize easily to the corresponding α -methylenebutylolactones under non-alkaline conditions [1, 2]. In recent times much attention has been paid to these tulip constituents by phytopathologists [3] and dermatologists [4] because they have strong fungitoxic and allergenic properties. For dermatologists, tuliposide-A and its reaction products seem much

more important than tuliposide-B, because the allergic skin disease caused by tulips seems to be caused by α -methylene- γ -butyrolactone derived from tuliposide-A; in this respect the β -hydroxy-derivative seems to be inert [5]. Tuliposide-A is present in considerable amounts in bulbs, stems, leaves and flowers of cultivated tulips.

In a recent publication, we reported results of a preliminary screening of liliaceous and related plants for tuliposides [5]. We stressed the need for more precise information about the distribution of tuliposide-A, the precursor of the allergenic lactone, because many liliiflorous taxa are cultivated on a commercial scale as ornamental plants. We also draw attention to the possibility that accumulation of tuliposides may represent a character of interest to plant systematics. The preliminary nature of the results and conclusions was stressed because the number of taxa investigated was small.

Meanwhile we have extended our coverage of taxa and considerably improved our analytical procedures. The present paper summarizes the results of a more elaborate study of the distribu-

✠ Arie Slob was the victim of a tragic accident in May 1974. This posthumous publication pays honor to an enthusiastic scientist and honest man, who is no longer with us. The final version of this article was drafted by Prof. R. Hegnauer (Laboratory for Experimental Plant Systematics, 5e Binnenvestgracht 8, Leiden, The Netherlands), to whom request for reprints should be addressed, Mrs. B. M. E. von Blomberg-v.d.Flier (Netherlands Institute for Preventive Medicine, TNO, Leiden) and Prof. Dr. H. L. Booy (Laboratory for Medical Chemistry, Leiden).

† Technical assistance.

‡ Cultivation and documentation of plants.

tion of tuliposides and includes some revisions of our previous findings.

RESULTS

Almost all plants available to us were investigated during the flowering stage. Each sample

was divided in flowers, stems, leaves and underground parts (i.e. roots, rhizomes, bulbs). In each instance presence or absence of tuliposides was investigated by three analytical procedures, PC, TLC and GLC. In plant parts apparently containing tuliposides, the amounts present were deter-

Table 1. Taxa investigated for the presence of tuliposides, arranged according to the classification of Huber [6]

Main groups of Liliiflorae	Family	Taxa investigated*
Dioscoreoid	Dioscoreaceae	<i>Dioscorea</i> cf. <i>hispida</i> 22638, <i>D.</i> cf. <i>quaternata</i> 22706, <i>D.</i> cf. <i>villosa</i> 22640, <i>D.</i> sp. 22639; <i>Tamus communis</i> 23068
Liliiflorae:		
Dioscoreales†	Trilliaceae†	<i>Medeola virginiana</i> 23314; <i>Paris quadrifolia</i> 23016; <i>Scolopus bigelovii</i> 22665; <i>Trillium erectum</i> 23414, <i>T. grandiflorum</i> 23413, <i>T. luteum</i> 23414, <i>T. sessile</i> , <i>T. stylosum</i> 23411, <i>T. undulatum</i>
Roxburghiales	Ruscaceae†	<i>Ruscus aculeatus</i> 22701
	Convallariaceae†	<i>Convallaria majalis</i> 22633; <i>Majanthemum bifolium</i> 22693, 23061; <i>Polygonatum</i> sp. 20728, <i>P. multiflorum</i> 23063, <i>P. odoratum</i> 20368, <i>P. verticillatum</i> 23019; <i>Smilacina racemosa</i> ; <i>Streptopus amplexifolius</i> 23047
Asparagoid	Asparagaceae†	<i>Asparagus</i> sp. 8370, <i>A.</i> sp. 8373
	Tecophilaeaceae†	<i>Tecophilaea cyanocrocus</i> cv. <i>violacea</i> 23419, <i>T. cyanocrocus</i> cv. <i>leichtlinii</i> 20491
	Anthericaceae†	<i>Anthericum liliago</i> 20702, 23024, <i>A. ramosum</i> 23119; <i>Paradisica liliastrum</i>
Liliiflorae:	Asphodelaceae†	<i>Asphodeline liburnica</i> 21434, <i>A. lutea</i> 22627; <i>Asphodelus microcarpus</i> 20731; <i>Bulbine annua</i> 21796; <i>Haworthia batesiana</i> 22651, <i>H. planifolia</i> cv. <i>variegata</i> 22652; <i>Kniphofia</i> × <i>pfitzeri</i>
Asparagales	Agavaceae	<i>Hosta</i> cf. <i>elata</i> 22705, <i>H.</i> cf. <i>fortunei</i> 22697, <i>H.</i> cf. <i>glauca</i> 20713
	Hemerocallidaceae	<i>Hemerocallis dumortieri</i> , <i>H. lilio-asphodelus</i> 22702, <i>H.</i> cv. 22696, 22698
	Alliaceae	<i>Allium coeruleum</i> (= <i>A. azureum</i>) 22704, <i>A. cepa</i> 23421, <i>A. karataviense</i> 22614, <i>A. sativum</i> 23576, <i>A. ursinum</i> 22615; <i>Brodiaea</i> cf. <i>hyacinthina</i> 22628, <i>B.</i> cf. <i>peduncularis</i> 22629, 22630, <i>B. terrestris</i> 23574, <i>B.</i> sp. 23573; <i>Ipheion uniflorum</i> 22653; <i>Nothoscordum inodorum</i> (= <i>N. fragrans</i>) 22662
	Hyacinthaceae†	<i>Lachenalia aloides</i> 23392; <i>Muscari armeniacum</i> 23420, <i>M.</i> sp. 22658; <i>Ornithogalum balansae</i> 22663, <i>O.</i> cf. <i>longibracteatum</i> 22721, <i>O.</i> sp. 22664; <i>Veltheimia viridiflora</i> (= <i>V. capensis</i>) 23429
	Amaryllidaceae	<i>Galanthus elwesii</i> 22645, <i>G. ikariae</i> 22646, <i>G. nivalis</i> 22647; <i>Leucojum aestivum</i> 22657, <i>L. autumnale</i> 22313, <i>L. vernum</i> 23386; <i>Narcissus bulbocodium</i> 22659, <i>N. Jonquilla</i> 22660, <i>N. nanus</i> (= <i>N. lobularis</i>), <i>N. asturiensis</i> (= <i>N. minimus</i>) 22661; <i>Pancratium maritimum</i> ; <i>Sternbergia colchiciflora</i> (= <i>S. clusiana</i>) 22666, <i>S. lutea</i> 22667
	Colchicaceae†	<i>Bulbocodium vernum</i> 23416, <i>Colchicum autumnale</i> 22631, <i>C. byzantinum</i> 22869, <i>C. speciosum</i> 22632; <i>Gloriosa superba</i> 22650, <i>G. virescens</i> cv. <i>Rothschildiana</i> 22648, cv. 22649; <i>Uvularia grandiflora</i> 22679, <i>U. perfoliata</i>
Colchicoid		<i>Crocus ancyrensis</i> 22634, <i>C. medius</i> 22870, <i>C. speciosus</i> 23384, <i>C. susianus</i> 22635, <i>C. tomasianus</i> 22636; <i>Gladiolus byzantinus</i> 22703, <i>G. segetum</i> 23575; <i>Iris bucharica</i> , <i>I. florentina</i> 22654, <i>I. graminea</i> 22655, <i>I. pseudacorus</i> 22700, <i>I. reticulata</i> 23415, <i>I. sibirica</i> 22656, <i>I. versicolor</i> 23430; <i>Tigridia pavonia</i> .
Liliiflorae:	Iridaceae	

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