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ORIGIN AND MIGRATION OF SOME NORTH ASIAN SPECIES OF THE GENUS *TRISETUM* PERS. (POACEAE)

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The affinity and origin of some North Asian species of the genus *Trisetum* were analysed based on morphological specific characteristics and karyological data.

Key words: Poaceae, *Trisetum*, hybridization, taxonomy, migration.

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INTRODUCTION

In North Asia (Siberia, the Russian Far East, North Mongolia), the genus *Trisetum* Pers. is represented by 10 species (Enushchenko 2009) belonging to 2 sections: *Trisetum* and *Trisetaera* (Aschers. et Graebn.) Honda. The most polymorphic and the world's largest section of this genus is a nomenclatural section *Trisetum*.

On the territory of North Asia, this section consists of 5 species belonging to 2 subsections: *Sibirica* (Chrtek) Prob. and *Agrostidea* Prob. The latter is represented by 2 species: *T. agrostideum* and *T. altaicum*. They occupy an intermediate position between the species of their own section (*Trisetum*) and the section *Trisetaera* represented by 5 species on the territory of North Asia: *T. alaskanum* Nash, *T. molle* (Michx.) Kunth, *T. mongolicum* (Hultén) Peschkova, *T. spicatum* (L.) K. Richt., and *T. wrangelense* (V. V. Petrovsky) Prob.

MATERIAL AND METHODS

Herbarium funds of the V.L. Komarov Botanical Institute RAS (St. Petersburg, LE), Central Siberian Botanical Garden SB RAS (Novosibirsk, NS, NSK), Institute of Biology and Soil Science FEB RAS (Vladivostok, VLA), Irkutsk State University (Irkutsk, IRKU) and Institute of Biological Problems of the North FEB RAS (Magadan, MAG) served as materials for the present work.

Short titles of the large herbaria of the RF (acronyms) are given according to the electronic version of the edition "Index Herbariorum" P.K. Holmgren & N.H. Holmgren (1998: http://swetgum.nybg.org/ih/...). When it is necessary to specify storing places of particular samples after a tag an acronym of the corresponding Herbarium is cited in the text of the article.

The *Trisetum* species were identified using various taxonomic literature (Tsvelev 1976, Probatova 1985, Peshkova 1990).

RESULTS AND DISCUSSION

A nomenclatural type *T. spicatum* of the section possesses a compact panicle (the panicle branches and the steam under the raceme are covered with

thick hairs), small anthers, and short hairs on the callus. However, other species of this section (*T. molle* and *T. alaskanum*) differ in friable panicles interrupted on their lower part or along the entire length as in *T. agrostideum* and *T. altaicum*.

Interestingly, *T. molle* is also similar to *T. agrostideum* in a number of other characteristics. For example, the hairy cover of panicle branches and steams under the raceme is nearly the only reliable characteristic for the division of these two species into different sections.

We found a large number of herbarium sheets in the botanical collections of Central Siberian Botanical Garden SB RAS (Novosibirsk, NSK) and Biology-Pedology Institute FEB RAS (Vladivostok, VLA) on which a "classical" (hirsute) *T. molle* was disposed with the naked plants similar in habitus. Researchers, who had seen this herbarium before, identified these plants as *T. agrostideum* which happened to be herborized accidentally with *T. molle*. We suppose that these naked forms could descend from *T. molle* within the population.

Concerning the variability of hirsute in *T. molle*, G. Peshkova (1990) stated that Siberian specimens of the species are not typical and belong to 2 separate geographic races. The northern race distributed from Kolyma to the Putorana Plateau and from the Arctic to Lake Baikal is characterised by thick-haired vaginas of the leaves and steams covered by hairs along their entire length. The southern race from the Stanovoe Upland to the south-east is less haired (Peshkova 1990).

It should be noted that *T. molle* is the only species of the genus on the territory of the former Soviet Union with the hexaploid number (2n = 42) of chromosomes (Krogulevich 1976). Tetraploid number (2n = 28) of chromosomes for this species (Sokolovskaya & Probatova 1975) is referred, in our opinion, to the close related species *T. alaskanum* (see the specimens in the VLA Herbarium). Hexaploid number (2n = 42) of chromosomes in *T. molle* and a wide range of hirsute variability of vegetative and generative organs may testify to hybrid origin of this species. *T. altaicum* (2n = 14) from Central Asia (Krogulevich 1972) and *T. spicatum* (2n = 28) from the Holarctic (Krogulevich 1976) are most likely to have been parental species. A triploid form (2n = 21) derived as a result of hybridization of these species cold be stabilised by means of autopolyploidy. Genome of hexaploid hybrid should consist of the *T. altaicum* genome, a naked species with friable panicle, and of the *T. spicatum* genome, a hirsute species with compact panicle.

The mountains of Central Asia may be regarded as the place of *T. molle* origin. Hybridization of *T. altaicum* with *T. spicatum* initiating the emergence of this species may occur in the coldest periods of the Pleistocene. However, a more ancient origin of *T. molle* is possible during the Alpine orogenesis mountain formation. The distribution of this species to the north-east deep into North Asia up to North America is referred to the end of the Pliocene or to the Pleistocene.

To our understanding, naked tetraploid forms could emerge during the dissemination of *T. molle* due to high heterogeneity of the genome of this species. These forms are likely to initiate the emergence of *T. agrostideum*, a North-Eurasian species. Moreover, we assume that *T. alaskanum* is also a tetraploid species derived from a hexaploid *T. molle*. Both morphological similarity and practically complete coincidence of the natural habitat of *T. molle* with the habitats of these species prove this hypothesis.

The north-western boundary of the *T. molle* habitat passes along the Podkamennaya Tunguska River (Krasnoyarsk Territory). To the south, this species is recorded only in Zabaikalye (the Baikal Region). To the west from Lake Baikal, it is replaced by *T. agrostideum* and *T. altaicum*. As it was mentioned above, Central Asia is the origin place of *T. molle* from where dissemination of this species started toward the north-east. The outline of *T. agrostideum* habitat shows that its dissemination was similar to that of *T. molle* which again underlines the close relations of the origin between these two species. Unlike *T.*

molle, *T. agrostideum* is not so common in the Russian Far East and absent in North America. Here it is replaced by *T. alaskanum*. The latter is separated from the general habitat of *T. molle* by a narrow littoral belt as it is characterised by more specific ecological conditions preferring the seacoast (Probatova et al. 2007).

N. Tsvelev (1976) noted that the Sayan and Daurian populations of *T. altaicum* are similar to *T. agrostideum*. Thus, *T. agrostideum* is very close genetically and morphologically not only to *T. molle* but also to *T. altaicum* and serves as an interlink between two subsections represented by these species.

T. wrangelense from Wrangel Island is an endemic species (Petrovsky 1979). However, in the VLA Collection we found specimens of this species from North America ("USA, Alaska, the coast of the Beaufort Sea, sand dunes, 27 VII 1990, S. Kharkevich") identified earlier as *T. spicatum*.

In the Paleogene-Neogene, when Eurasia and North America were connected with a wide bridge of land, *T. wrangelense* was distributed from the Taimyr Peninsula to Alaska. In the Quaternary, the habitat of this species reduced considerably due to the sea transgression and huge glaciations of the Northern Hemisphere. However, the largest part of Alaska and Wrangel Island were not subject to glaciation; these territories appeared to be refugia in which *T. wrangelense* did not experience floods and glaciation invasion.

T. mongolicum described from the Tuva Republic was considered earlier as a species from Central Asia (Hulten 1959; Tzvelev 1976). Its morphology is slightly different from *T. spicatum*. Therefore, it was difficult for many authors to distinguish these two species. G. Peshkova (1990, maps 76 and 77) differentiated these species according to their habitat: specimens to the south of the polar circle were regarded as *T. mongolicum*, whereas to the north of the polar circle – as *T. spicatum*. We support the opinion of the majority of authors who consider that the habitat of *T. spicatum* is wider. This species is common in North America, and it stretches from the Scandinavian Peninsula to West Pamir. This species migrated from the north deeper into the continent during colder periods of the Pleistocene. At present, it is the most common species in the mountains of Western and especially of Eastern Siberia.

Thus, if we consider *T. mongolicum* as a taxon derived from *T. spicatum*, we may assume that it is younger compared to the parent species. It is very difficult to distinguish these two species due to their unstable characteristics and a great number of intermediate forms.

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