# Characteristics of important diploid and tetraploid subspecies of *Dactylis* from point of view of the forage crop production

**V. Míka, A. Kohoutek, V. Odstrčilová**

*Research Institute of Crop Production, Prague-Ruzyně, Research Station of Grassland Ecosystems, Jevíčko, Czech Republic*

**ABSTRACT**

Tetraploid ecotypes originated from Atlantic coastal region in comparison to diploids are of large growing stature, they build looser tuft ($P_{0.95}$), fewer vegetative offshoots ($P_{0.99}$). Their leaves are coarser ($P_{0.99}$), culms are thicker (N.S.), less foliaged ($P_{0.99}$), the thousand-seed-weight is higher ($P_{0.99}$). They are in heading time earlier, generally more productive, the forage quality is good. From diploid subspecies, it is the ssp. *aschersoniana*, which adapted to the climatic condition of central Europe best and meets the requirements of herbage production. Ssp. *galiciana* proved to be also a high yielding grass, possessing higher resistance against rust, mildew, and good resistance against fusarioses. Ssp. *lusitanica* has smoother leaves, but it is less yielding, leaves proportion in herbage is lower, and shows lower winter hardness. It seems to be of little interest as a genetic resource for simple forage grass breeding in this country.

**Keywords:** grasses; cocksfoot; cultivars; ecotypes; forage grass breeding; genetic resources

The natural distribution of the genus *Dactylis* shows that tetraploids ($2n = 28$) are most common and generally occurring forms of cocksfoot. Diploids ($2n = 14$) occur in particular areas, and finally hexaploids have been found only in two localities in *Cyrenaica* (Borrill 1978). The different taxonomic varieties possess different economic values, of course, which was probably first shown by Czech botanist Domin (1943).

Stebbins and Zohary (1959) argue with opinions of many botanists on species definition in polyploid complex. They came to a view that the most practical and at the same time theoretically based is recognition of one species with two collateral series of subspecies, one on the diploid level, the other on the tetraploid one. The diploid subspecies included (1) Eurasian and (2) Mediterranean morpho-geographic groups. The first group contains large-growing robust and vigorous type, from which subsp. *aschersoniana* (at present called *Dactylis polygama* Horvat.) is of great agronomical value. This subspecies evolved in deciduous forest of oak, beech and hornbeam. In Central Europe, it is accompanied by mesophytic woodland tertiary flora. Originally subsp. *aschersoniana* was represented by forms with mezofile constitution, nowadays-even xerofile ecotypes reach here. Low winter temperature is the main factor limiting their growth. These are therefore summer-growing conservation types. Another subspecies of this group is *Galician* diploid. The second group mentioned is rather heterogeneous (esp. in phenotypical traits) and contains more than ten subspecies, generally of small statue and low agronomic value. Only the subsp. *lusitanica* of them is of somewhat large-growing habit and of some agronomic importance.

The tetraploid subspecies are represented by subsp. *glomerata* and *hispanica*. The former is widespread large-growing agricultural cocksfoot of the temperate Europe, west and central Asia and North Africa (Borrill 1978). The latter one is grass of small statue, with a winter-growing and summer dormant life cycle, similarly as it occurs in Mediterranean diploid group.

Phenotypic variation between ecotypes may be noted. All valuable genetic resources characterized in the diploid or tetraploid series can be readily used in breeding of tetraploid cultivars (Borrill 1967). Of diploids, the subspecies *aschersoniana*, *lusitanica* and recently *galiciana* can be regarded as pure types, which may have distinctive agricultural characteristics. Some cocksfoot cultivars have been already derived: e.g. in U.K. cv. Sabtoron (after polyploidization of diploids) and cv. Calder (derived by heteroploid method, i.e. crossing diploid and tetraploid subspecies – Lewis 1975), in Tasmania cv. Porto (based on subsp. *lusitanica*), in Spain cv. Adac 1 (based on subsp. *lusitanica*, too) or diploid variety Conrad (based on subsp. *galiciana*) in the U.K. Breeding based on geographically distant biotypes may have better results than using local materials (Prończuk 1980).

This study is aimed to characterize phenotypical differences and agronomical value of diploid and tetraploid ecotypes from Mediterranean and Atlantic regions (Míka and Mousset 2001) grown in Central European environment in order to (1) identify such characteristics and (2) identify new geographical and ecological sources of valuable genetic material for the purpose of extending genetic variability.

## MATERIAL AND METHODS

Collection of cocksfoot contained:

– 35 items of tetraploid ecotypes from the Atlantic coastal zone of France, Spain and Portugal, accompanied by

all seven Czech *Dactylis glomerata* ssp. *glomerata* cultivars
– 5 items of diploid ecotypes of *D. g.* ssp. *galiciana* from the coast in the southwest of Spain and north of Portugal
– 3 items of diploid ecotypes of *D. g.* ssp. *lusitanica* from the north of Portugal, accompanied by 1 Czech *D. g.* ssp. *aschersoniana* (syn. *Dactylis polygama* Horvat.) cultivar Tosca

These ecotypes and cultivars were used for the first time in 1997 to establish identical field trials at two sites in the Czech Republic and were studied for five years in compliance with unified methodology thoroughly described previously (Míka and Mousset 2001). They were used for the second time in year 2000 to establish new identical series only at the Jevíčko site, which were followed for two harvest years. From each ecotypes or cultivar, a sufficient number of plants were precultivated in the greenhouse and these were planted into the field trials. The trials scheme contained two plantation alternatives:
a) in the spacing 0.45 × 0.45 m (30 plants) in one row; next symbolised by I (individuals)
b) in three rows with spacing 0.15 m, plants being in the row distant 0.08 m from each other (36 plants), simulating condition of a normal cover; next symbolised by H (dense cover)

Each alternative at each trial site had two replications. Twenty-six morphological and agronomic traits were evaluated separately in the determinate way of planting and term, defined previously. Parameters of nutritional quality (Table 3) were measured with NIRSystems 6500. Principal component analyses (PCA) were carried out on the overall data (Tables 1–3) and for each of the five groups (ecotypes, cultivars). The results are presented in Figures 1 and 2.

## RESULTS

Based on traits listed in the Tables 1–3 PCA show distinct distribution effect (Figures 1 and 2). Diploid subspecies, although represented in the experiment only by 9 items, break into sufficiently delimited units (Figure 1). In contrast, tetraploid subspecies cover the same poles as diploids (Figure 2), in accordance with their habitats occupied in the nature. Diploids there interpenetrate the tetraploid zones and occur especially on more specialised sites.

All tested items of *Dactylis* had good winter hardness in the older trial series at both sites. However, in the new series of trials at the Jevíčko site some diploid ecotypes of cocksfoot had somewhat poorer over-wintering in the first winter (2000/2001): after that winter in the trial with

Table 1. Some morphological, anatomical and growth characteristics of *Dactylis glomerata* subspecies

| Characteristic | Tetraploids ($2n$ = 28) | | Diploids ($2n$ = 14) | | | *L.S.D.* | |
|---|---|---|---|---|---|---|---|
| | ssp. *glomerata* | | *galiciana* | *lusitanica* | *aschersoniana* | | |
| | ecotypes | cultivars | ecotypes | ecotypes | cultivar | $P_{0.95}$ | $P_{0.99}$ |
| Plant height in heading (mm) | 598 | 643 | 607 | 645 | 589 | 44 | 58 |
| Share of leaves in fresh herbage weight in heading (%) | 49.3 | 52.6 | 49.0 | 43.8 | 46.3 | 10.1 | 13.3 |
| Share of cauline leaves in total fresh leaves weight (%) | 16.4 | 17.2 | 18.9 | 19.5 | 22.0 | 3.3 | 4.4 |
| Lamina length of sterile offshoots (mm) | 246 | 278 | 230 | 250 | 292 | 37 | 49 |
| Lamina width of sterile offshoots (mm) | 5.9 | 6.2 | 5.7 | 5.9 | 5.8 | 1.4 | 1.8 |
| Lamina length of 3rd cauline leaf (mm) | 207 | 215 | 202 | 207 | 243 | 32 | 42 |
| Lamina width of 3rd cauline leaf (mm) | 5.2 | 5.4 | 4.6 | 4.7 | 4.6 | 1.3 | 1.7 |
| Area of 3rd cauline leaf lamina according to Kemp (1960)* ($mm^2$) | 974 | 1050 | 841 | 880 | 1012 | 275 | 363 |
| Leaf harshness (9–1; 9 = smooth leaf) | 4.9 | 5.1 | 6.8 | 7.2 | 7.3 | 1.2 | 1.6 |
| Number of siliceous trichomes at 1 mm cauline leaf lamina margin | 7.1 | 7.0 | 6.8 | 7.3 | 8.9 | 1.3 | 1.7 |
| Height of trichome (μ) | 121 | 124 | 71 | 103 | 80 | 27 | 36 |
| Number of vascular bundles at the transect in the middle of 3rd cauline leaf | 14.7 | 14.5 | 14.0 | 14.8 | 15.3 | 0.8 | 1.1 |
| Leaf colour (9–1; 9 = dark green) | 7.9 | 8.2 | 7.9 | 7.0 | 6,2 | 0.9 | 1.2 |
| Culm width (mm) | 3.11 | 3.16 | 2.93 | 3.04 | 2.95 | 0.22 | 0.29 |
| Panicle length (mm) | 105 | 106 | 102 | 103 | 103 | 3 | 4 |
| Length of bare branch at the inflorescence base (mm) | 46.8 | 51.3 | 30.1 | 40.4 | 38.5 | 10.4 | 13.7 |
| Number of flowers in the spikelet | 3.2 | 3.1 | 2.8 | 3.0 | 3.4 | 0.5 | 0.7 |
| Thousand seeds weight (g) | 1.22 | 1.37 | 0.63 | 0.69 | 0.65 | 0.32 | 0.42 |
| Number of flower heads in 1 m of row length | 91 | 96 | 110 | 143 | 163 | 52 | 69 |
| Tuft density (9–1; 9 = most dense) | 7.0 | 7.3 | 7.1 | 8.0 | 7.8 | 0.8 | 1.1 |

* lamina area = $c.l.w$; where $c$ = coefficient (0.905), $l$ = lamina length, $w$ = lamina width in the middle

Table 2. Agronomical features of *Dactylis glomerata* subspecies

| Characteristic | Tetraploids (2*n* = 28) | | Diploids (2*n* = 14) | | | *L.S.D.* | |
|---|---|---|---|---|---|---|---|
| | ssp. *glomerata* | | *galiciana lusitanica aschersoniana* | | | | |
| | ecotypes | cultivars | ecotypes | ecotypes | cultivar | $P_{0.95}$ | $P_{0.99}$ |
| Over-wintering (9–1; 9 = best) | 7.7 | 8.3 | 6.9 | 7.3 | 8.5 | 1.4 | 1.8 |
| Earliness in heading (number of days after May 1) | 22 | 25 | 27 | 28 | 36 | 6.5 | 8.6 |
| Annual dry matter (DM) yield (t.ha$^{-1}$) | 5.16 | 5.78 | 4.83 | 5.01 | 4.96 | 0.16 | 0.21 |
| Share of 1st cut in total annual DM yield (%) | 48.8 | 54.9 | 50.3 | 49.2 | 45.7 | 4.4 | 5.8 |
| Share of 3rd cut in total annual DM yield (%) | 24.4 | 15.5 | 21.3 | 22.6 | 21.8 | 2.3 | 3.0 |
| Regrowing after 1st cut (9–1; 9 = highest) | 7.2 | 7.2 | 6.8 | 7.3 | 7.0 | 0.5 | 0.7 |
| Rust resistance (9–1; 9 = highest) | 6.5 | 6.8 | 7.3 | 6.7 | 6.8 | 0.6 | 0.8 |
| Fusarium resistance (9–1; 9 = highest) | 6.3 | 7.5 | 6.8 | 6.5 | 7.6 | 0.9 | 1.2 |
| Grass mildew resistance (9–1; 9 = highest) | 7.1 | 7.1 | 7.3 | 6.8 | 7.1 | 0.4 | 0.5 |
| Virus resistance (9–1; 9 = highest) | 7.4 | 7.5 | 7.4 | 7.0 | 7.4 | 0.5 | 0.7 |

scattered planting of individuals (I), items of *Dactylis glomerata* ssp. *galiciana* over-wintered from > 95% and items of *D. g.* ssp. *galiciana* over-wintered from > 89%. The remaining plants were so much weakened after winter that DM yield decreased in the following 1st cut (41.5%, resp. 31.7%, related to the whole experiment average). They regenerated their vigour until the term of the 2nd cut and rendered 99.2%, resp. 63.6% of the yield (related to the whole experiment average). At the same site but in dense sward (H) even the above-mentioned items over-wintered satisfactorily, the plants were only slightly weakened and they recovered quickly and well before the first cut. Solitary planting in a wide spacing in the field nursery (I) causes that effects of frost, esp. alternation of freezing and warmer periods during winter, are much harder than that on the plants in the dense sward (H). Although the course of winter 2000/2001 was not distinctively different from the winter 1997/1998, individual plants reacted on the every alternation in frosty period pattern more susceptibly.

None of them demonstrated observable active growth during non-frost winter periods without snow cover, or summer growth dormancy during summer drought.

Tetraploid ecotypes and cultivars of *Dactylis glomerata* ssp. *glomerata* were, when compared to diploids, of more stature habitus, they had looser tuft ($P_{0.95}$), fewer fertile offshoots ($P_{0.99}$), they were slightly better foliaged (N.S.). Leaf laminas are shorter ($P_{0.95}$), somewhat wider (N.S.), coarser ($P_{0.99}$), with fewer vascular bundles (N.S.). Culms are thicker (N.S.), less foliaged ($P_{0.99}$), panicles somewhat higher (N.S.), with obviously longer bare branch at the inflorescence base ($P_{0.99}$). Number of individual flowers in the spikelet is usually similar for both cytotypes. However, 1000-seeds weight (TSW) is significantly higher ($P_{0.99}$) – Table 1.

Tetraploids were in heading date earlier (esp. in comparison to subsp. *aschersoniana*), in annual dry matter (DM) yield more productive ($P_{0.95}$), with high share of 1st harvest (esp. in the case of tetraploid cultivars) – Table 2. Forage quality varies among and within subspecies (Table 3). For example, coefficient of variance V for organic matter digestibility (OMD) in the 1st harvest of tetraploid ecotypes was 6.3%, and variance coefficient for fibre was 11.9%.

Among individual diploid subspecies, *Dactylis* there were determined significant differences with regards to morphological and anatomical features, agronomic and nutritional values. Subspecies *aschersoniana*, represented here by cultivar Tosca, has denser tuft, high number of offshoots per a plant ($P_{0.99}$), offshoots are finer, shorter,

Table 3. Herbage nutritional quality of *Dactylis glomerata* subspecies

| Characteristic | Cut | Tetraploids (2*n* = 28) | | Diploids (2*n* = 14) | | | *L.S.D.* | |
|---|---|---|---|---|---|---|---|---|
| | | ssp. *glomerata* | | *galiciana lusitanica aschersoniana* | | | | |
| | | ecotypes | cultivars | ecotypes | ecotypes | cultivar | $P_{0.95}$ | $P_{0.99}$ |
| Organic matter digestibility (OMD) | 1 | 69.4 | 71.5 | 71.8 | 70.7 | 72.6 | 1.8 | 2.4 |
| Protein (CP) (g.kg$^{-1}$ DM) | | 130 | 134 | 131 | 128 | 132 | 6 | 8 |
| Fibre (CF) (g.kg$^{-1}$ DM) | | 267 | 260 | 255 | 265 | 257 | 11 | 15 |
| Nett energy of lactation (NEL) (MJ.kg$^{-1}$ DM) | | 5.8 | 5.9 | 6.1 | 6.0 | 6.1 | 0.4 | 0.5 |
| Organic matter digestibility (OMD) | 3 | 74.9 | 75.8 | 76.2 | 76.0 | 75.9 | 2.1 | 2.8 |
| Protein (CP) (g.kg$^{-1}$ DM) | | 162 | 165 | 170 | 165 | 168 | 9 | 12 |
| Fibre (CF) (g.kg$^{-1}$ DM) | | 235 | 220 | 221 | 228 | 222 | 10 | 13 |
| Nett energy of lactation (NEL) (MJ.kg$^{-1}$ DM) | | 6.2 | 6.3 | 6.2 | 6.2 | 6.3 | 0.3 | 0.4 |

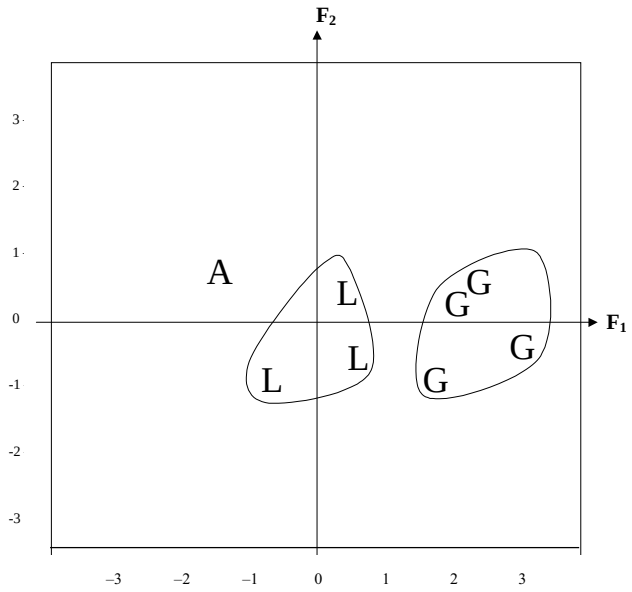


Figure 1. Organisation of diploid subspecies (A = *Dactylis glomerata* ssp. *aschersoniana*, L = *Dactylis glomerata* ssp. *lusitanica*, G = *Dactylis glomerata* ssp. *galiciana*)

$F_1$, $F_2$ = axes of Principal Component analyses (PCA)

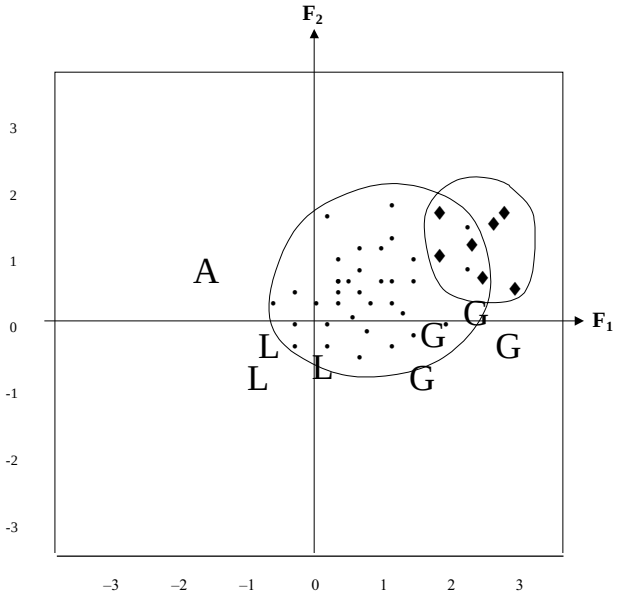


Figure 2. Organisation of tetraploid subspecies *glomerata* (• = ecotype, ♦ = cultivar)

$F_1$, $F_2$ = axes of Principal Component analyses (PCA)

with higher proportion of cauline leaves out of total fresh leaves weight. It has looser panicles than *D. g.* ssp. *glomerata*, with fewer spikelets in the clusters, its lemmas are hairless on the keels and have shorter awn-points. They make up denser and lower vegetation cover, plants are of semi-erected to erected shape. Although trichomes on the leaf edge are more frequent, they are lower ($P_{0.99}$) and the leaf looks smoother ($P_{0.99}$). Subspecies *aschersoniana* exhibits great winter hardness, it is one week later in heading compared to the average of tetraploid cultivars. However, it gives about 15% lower annual DM yield (Table 2), but somewhat better annual DM yields distribution through harvests. Herbage quality is slightly better, esp. OMD, protein and NEL (i.e.nett energy for lactation).

Diploid subsp. *galicina* seems in the range of morphological and production features also interesting. It is high yielding and it possesses higher resistance against rust and mildew (Table 2). Especially ecotype No. 39 has a remarkably smooth leaf, it is productive, well foliaged, and exhibits good resistance against fusarioses.

Diploid subspecies *lusitanica* has quite smooth leaves, but leaf proportion in herbage is somewhat (N.S.) lower. It is less productive, its health condition is good, and forage quality is comparable with tetraploids. However, poorer winter hardness of individuals over the 1st winter after planting at the Jevíčko site warns against definite recommendation for use in climatic conditions of central Europe.

## DISCUSSION

Tetraploids in the nature are the most successful types in *Dactylis,* they are more numerous, more widely distributed and colonise a great range of habitats. In addition, according to the evaluation of their qualities and features they occupy rather compact position in relation to PCA axes (Figure 2) though some shift of Czech cultivars from the ecotypes of Atlantic and Mediterranean region is obvious. It can be documented that these cultivars had been derived largely from original ecotypes from continental Europe. In contrast, maritime ecotypes were selected for these field trials by Mr. Mouset (Míka and Mousset 2001) primarily to extend vegetation period until the beginning of winter and to start vegetation early in spring. Using these tetraploid ecotypes in further breeding of *Dactylis glomerata* ssp. *glomerata* for continental conditions seems to be from cytogenetic reasons much easier than using diploid ecotypes (Borrill 1978), although the latter can contribute to extension of genetic variability much more. Still even this is feasible, which is documented by tetraploid cultivars of cocksfoot that were bred on their basis and registered in the U.K. in the 1970s. Some of the tetraploid ecotypes (esp. from Brittany) exhibit significantly higher grass mildew and rust (crown and orchardgrass rust) resistance (Míka and Mousset 2001) and their use in the breeding of new cultivars for continental conditions may prove useful (similarly Prońzuk 1980).

In the vegetative organs of *Poaceae*, the most important diagnostic feature is a leaf, because it exhibits relatively minor anatomical and structural variation, as well as relatively little interaction with environment. Many of these variations are rather quantitative than qualitative (Metcalfe 1960). For example, the number of vascular bundles at the middle transect of 3rd cauline leaf for the tetraploid ecotypes was relatively constant ($V$ = 2.3%). In contrast, the number of trichomes per 1 mm of the edge

of leaf lamina is more variable feature ($V$ = 15.8%), similarly to leaf harshness ($V$ = 18.2%). Considering evidential interaction of harshness and quality of light (Míka and Našinec 1983), it is necessary to evaluate harshness for plants grown in full sunlight. Although according to the share of leaves on the fresh herbage weight of subsp. *glomerata* appears to be high quality grass (Table 1), in fact only a few ecotypes tested have better digestibility, without any obvious relation to their origin. These results suggest that with relatively high share of leaves, somewhat lower nutritional quality is not due to a direct influence of environment on the digestibility of a cell wall, but it is more likely to be due to differences in the morphological and anatomical structures. It does not exclude that many populations exist that are superior in respect of physiological attributes affecting yield and nutritional qualities. There is a continuing need to identify such characteristics, and to develop suitable screening procedures for them. Tetraploid subspecies *glomerata* appears to be a hybrid sharing characteristics of both temperate and Mediterranean diploids. It is the most successful type in *Dactylis* (Borrill 1978).

The diploids, in the light of these results, could be seen not only as a material for improving tetraploid cultivars, but also as a valuable grass as such for special purposes. The lower productivity and obvious ability to form dense cover of cultivar Tosca predestine it for the usage in soil setting aside (Šantrůček et al. 2001), it can be used for grassing over of interstrips in cocksfoot due to high shadow tolerance and persistency. Its relatively weak competition ability allows its use as a non-aggressive partner in mixtures with alfalfa or other legumes (similarly Vacek 1974). Overall, the forest zone subsp. *aschersoniana* is well adapted to the production usage demands in continental conditions (Borrill 1978).

The subsp. *galiciana* has also high direct agronomic value, whereas subsp. *lusitanica* only limited. The poorer winter hardness of ssp. *lusitanica* in one trial is in accordance with results of previous testing at Welsh Plant Breeding Station in Aberystwyth (Borrill 1978). Although they overwintered obviously better in the dense sward than in individual plantations, their use in the condition of central Europe may require higher caution and thorough testing than the older series of trials suggested (Míka and Mouset 2001). Nevertheless, in principle it is possible, which is well documented by the existence of varieties that are grown for forage production in the Western Europe and elsewhere.

The financial support of the project GA CR Prague no. 521/00/1014 "Analysis of growth and agronomy characteristics of spontaneous population of cocksfoot (*Dactylis glomerata* L.) from Mediterranean and Atlantic regions" is greatly acknowledged.

## REFERENCES

Borrill M. (1967): Colchiploid and heteroploid techniques for the incorporation of diploid *Dactylis* genomes into tetraploid hybrids. Ann. Rep. WPBS Aberystwyth 1966: 51–56.

Borrill M. (1978): Evolution and genetic resources of cocksfoot. Ann. Rep. WPBS Aberystwyth 1977: 190–209.

Domin K. (1943): Morfologická studie o rodu *Dactylis*. Acta Bot. Bohem., *16*: 147.

Kemp C.D. (1960): Method of estimating the leaf area of grasses from linear measurements. Ann. Bot., *24*: 491–499.

Lewis E. J. (1975): An alternative technique for the production of amphiploids. Ann. Rep. WPBS Aberystwyth 1974: 15.

Metcalfe C.R. (1960) Anatomy of the monocotyledons. I. Gramineae. Oxford Univ. Press.

Míka V., Mousset C. (2001): Vegetative and agronomic characteristics of wild populations of orchard-grass (*Dactylis glomerata* L.) from Mediterranean and Atlantic regions grown in Central European conditions. Rostl. Výr., *47*: 174–180.

Míka V., Našinec J. (1983): Vliv osvětlení na drsnost listu srhy laločnaté (*Dactylis glomerata* L.). Sbor. Věd. Prací VŠÚP Troubsko, 8: 45–51.

Prończuk S. (1980): Problemy metodyczne w hodowli wyspecjalizowanych odmian traw na przykladzie kupówki pospolitej (*Dactylis glomerata* L.). Hodow. Rośl., *24*: 77–94.

Stebbins G.L., Zohary D. (1959): Cytogenetic and evolutionary studies in the genus *Dactylis*. 1. Morphology distribution and interrelationships of the diploid subspecies. Univ. California Publ. Bot., *31*: 1–40.

Šantrůček J., Svobodová M., Brant V. (2001): Yields and weed infestation of more years forage crops on set – aside arable land. Zeszyty naukowe, č. 330, 54/I, Akad. Roln. Kollataja, Kraków: 59–68.

Vacek V. (1974): *Dactylis polygama* (Horvat.) Dom. as a potential genetic source. Sbor. ÚVTI – Genet. a Šlecht., *10*: 89–100.

Received on February 5, 2002

## ABSTRAKT

**Charakteristiky pícninářsky významných diploidních a tetraploidních subspecií *Dactylis***

Diploidní a tetraploidní ekotypy *Dactylis*, pocházející z mediterránní a atlantické oblasti, byly hodnoceny v polních pokusech na dvou místech v ČR po dobu pěti let a v dalším pokuse s časovým posunem na jednom místě po dva roky. Bylo k nim přiřazeno sedm českých kultivarů *Dactylis glomerata* ssp. *glomerata* a kultivar *Dactylis glomerata* ssp. *aschersoniana* Tosca. Záměrem studie bylo identifikovat rozdíly ve významných růstových charakteristikách a v agronomické hodnotě. Materiál z této geografické oblasti byl zkoumán též z hlediska genetických zdrojů pro účely rozšíření variability s možným využitím ve šlechtění *Dactylis*. Pokusy byly vedeny podle jednotné metodiky, zahrnující dva způsoby výsadby: a) indivi-

duální výsadba (v polní školce) ve sponu 0,45 × 0,45 m, celkem 30 rostlin, b) hustý zápoj, tj. každý pokusný člen vysázen na třech řádcích (meziřádková vzdálenost 0,15 m), rostliny v řádku na 0,08 m, celkem 36 rostlin. Hodnoceno bylo 26 významných morfologických a agronomických znaků, a to diferencovaně v určitém způsobu výsadby a termínu, detailně specifikovaných v předchozí práci. Tetraploidní ekotypy ve srovnání s diploidními ekotypy bývají robustnějšího vzrůstu, vytvářejí volný trs ($P_{0,95}$) a méně vegetativních výběžků ($P_{0,99}$). Jejich listy bývají drsnější ($P_{0,99}$), stébla spíše silnější (N.S.), méně olistěná ($P_{0,99}$). Obilky vykazují vyšší HTS (tj. hmotnost tisíce semen) – $P_{0,99}$. V metání bývají ranější, v produkci sušiny píce výnosnější, kvalita píce je dobrá. Z diploidních subspecií je nejlépe adaptována na klimatické podmínky střední Evropy *Dactylis glomerata* ssp. *aschersoniana*, která se zároveň přibližuje pícninářským požadavkům. Ssp. *galiciana* se ukázala rovněž jako výnosná diploidní *Dactylis*, vykazující vyšší rezistenci vůči rzem, padlí travnímu a dobrou rezistencí vůči fuzáriím. Ssp. *lusitanica* má hladké listy, poskytuje ale nízké výnosy sušiny, podíl listů v píci bývá nižší a v opakovaném polním pokuse se prokázala její menší zimuvzdornost. Proto se ukazuje jako méně zajímavá pro přímé využití ve šlechtitelských programech s *Dactylis* pro podmínky střední Evropy.

**Klíčová slova:** trávy; srha; kultivary; ekotypy; šlechtění pícních trav; genetické zdroje

*Corresponding author:*

Ing. Václav Míka, DrSc., Výzkumný ústav rostlinné výroby, Praha-Ruzyně, Výzkumná stanice travních ekosystémů, Jevíčko, K. H. Borovského 461, 569 43 Jevíčko, Česká republika, tel.: + 420 462 32 78 14, fax: + 420 462 32 78 14, e-mail: vste@iol.cz