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Morphological traits of perennial ryegrass accessions in Black Sea Region of Turkey

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Abstract. Breeding of perennial ryegrass (*Lolium perenne* L.) has a short history in Turkey and ecotype collections play a significant role in broadening the genetic basis. This study aimed to: (i) collect perennial ryegrass seeds from different locations of Mid-Black Sea Region; and (ii) characterize the collected material. To characterize these accessions, seeds were sown in seed trays and seedlings were transplanted to experimental field. At the end of the observations and measurements, plants height, internode length, main stem diameter, number of node, flag leaf blade length, flag leaf blade width, spike length, spikelet number/spike, fertile tiller number/plant and seed yield/plant were found between 30-106 cm, 2.5-16 cm, 0.84-2.87 mm, 2-6, 4-38 cm, 0.20-0.75 cm, 11-34 cm, 12-38, 75-517, 12-52.81 g/plant, respectively. Considering all observations and assessments, 20 plants for hay production, 26 plants for pasture improvement and 35 plants for recreational areas were found out as promising for further breeding studies.

Keywords. *Lolium* – Natural vegetation – Morphological characters – Seed yield.

Caractères morphologiques des accessions pérennes de ray-grass dans la région de la mer Noire en Turquie

Résumé. L'amélioration de ray-grass pérenne (*Lolium perenne* L.) présente une courte histoire en Turquie et les collections d'écotypes jouent un rôle significatif pour élargir la base génétique. Cette étude vise à : (i) collecter des semences de ray-grass pérenne dans différents sites de la région moyenne de la mer Noire ; et (ii) caractériser le matériel collecté. Afin de caractériser ces accessions, les semences ont été semées dans des portoirs de semences et les plants ont été transplantés dans un champ expérimental. À la fin des observations et mesures, la hauteur des plantes, la longueur internodale, le diamètre de la tige principale, le nombre de noeuds, la longueur de la feuille drapeau, la largeur de la feuille drapeau, la longueur des épis, le nombre d'épillets/épi, le nombre de tiges fertiles number/plante et le rendement en semences/plante étaient respectivement de 30-106 cm, 2,5-16 cm, 0,84-2,87 mm, 2-6, 4-38 cm, 0,20-0,75 cm, 11-34 cm, 12-38, 75-517, 12-52,81 g/plante. Considérant toutes les observations et évaluations, on a détecté comme prometteuses pour des études ultérieures d'amélioration, 20 plantes pour la production de foin, 26 plantes pour l'amélioration des pâturages et 35 plantes pour des aires récréatives.

Mots-clés. *Lolium* – Végétation naturelle – Caractères morphologiques – Rendement en semences.

I – Introduction

For both Turkey and Middle Black Sea Region, suitable forage species and cultivars should be released to use for pasture improvement, increase the qualified forage production and recreational green areas. The most important source for this purpose are the local populations which have already existed in the natural flora and have been adapted to ecological conditions of the region (Acar *et al.*, 2001; Ayan *et al.*, 2006a).

In this frame, legume and grass seeds should be collected from the natural flora. They also should be preserved, reproduced and taken under breeding studies regarding some characters. Natural flora of Middle Black Sea Region is very rich in terms of plant species, thus harboring

many diversified species, mainly forages, and even many varieties within species (Davis, 1968, 1988; Engin and Korkmaz, 1991; Kılınç and Karakaya, 1992; Kevseroğlu *et al.*, 1994; Özen and Kılınç, 1996; Ayan *et al.*, 2006b; Acar *et al.*, 2009; Mut *et al.*, 2009).

In this research, plant seeds belonging to *Lolium* species were collected from the natural flora of Samsun, Sinop and Ordu provinces. First of all, some morphological and agricultural characters of these plants were defined and then promising varieties which could be used in pasture improvement, forage cultivation and establishment of recreational green areas have been selected to evaluate in breeding studies.

II – Materials and methods

A total of 331 samples were collected from 44 different spots of Ordu, Samsun and Sinop provinces, located in Middle Black Sea Region of Turkey, in the period of June-September 2007. The collected seeds were sown in seed trays in January 2008. At the end of March and at the beginning of April 2008, seedlings were transplanted into field at about 5 cm depth below the surface, at 70 cm row spacing and 50 cm plant spacing within the rows. All observations and measurements were done in the second year of the study and the obtained data were analyzed using SPSS 13.0 program.

III – Results and discussion

Average plant height of the perennial ryegrass plants were measured as 56.14 cm. The first flowering date of ryegrass accessions were 10-22 May.

The big difference between the lowest and the highest plant height (30 cm and 106 cm, respectively) indicates that large variation exists among the samples (Table 1 and Fig. 1). Average distance between internodes of the 331 ryegrass samples was 6.91 cm. Although a big range on distance between internodes was recorded (2.5-16 cm), most of the samples had 6 and 8 cm internode-lengths (Fig. 2). Other measurements such as the mean stem diameter, the average number of internodes, the average flag leaf blade length and width were 1.67 mm, 3.99, 15.42 cm and 0.38 cm, respectively. It is also noteworthy to mention that flag leaf blade length of the samples ranged from 4 to 38 cm (Fig. 3). The huge range among these data shows that there might be a large genetic differentiation among the samples. It is the notion among the breeders that the high level of genetic diversity in a gene pool contributes to variation, demonstrating the significance of selection.

Table 1. Definition of statistical values and results obtained from the experiment

Features	N	Mean	Minimum	Maximum	CV (%)
Plant height (cm)	331	56.14	30	106	19.84
Internode length (cm)	331	6.91	2.5	16	33.50
Main stem diameter (mm)	331	1.68	0.84	2.87	21.33
Node number	331	3.99	2	6	19.94
Flag leaf blade length (cm)	331	15.42	4	38	28.80
Flag leaf blade width (cm)	331	0.38	0.20	0.75	20.87
Spike length (cm)	331	19.94	11	34	20.36
Number of spikelet per spike	331	22.75	12	38	18.07
Number of fertile tiller	331	243.78	75	517	23.66
Seed yield per plant (g)	331	23.66	12	52.81	29.53

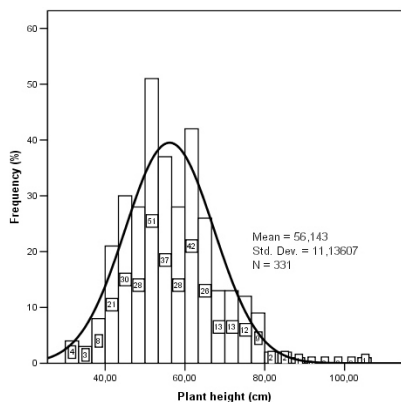


Fig. 1. General distribution of plant height values of perennial ryegrass plants (cm).

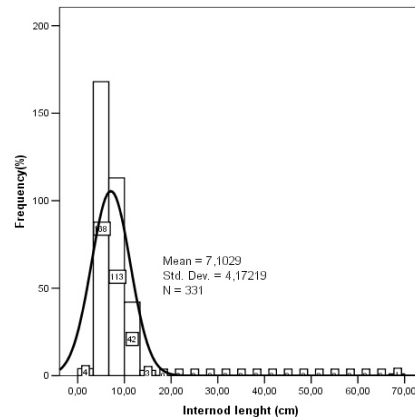


Fig. 2. General distribution of internode length values of perennial ryegrass plants (cm).

Average spike length, which is one of the important characters for seed yield, was figured out as 19.94 cm, ranging from 11 and 34 cm. The mean spikelet number per spike was 22.75. The lowest and highest number changed between 12 and 38, respectively (Table 1 and Fig. 4). The number of fertile tiller per plant varied from 75 to 517 (Table 1 and Fig. 5), and the average of spikelet number per plant was recorded as 243.78. A wide difference was observed in seed yield per plant obtained from different locations and the average seed yield was weighted as 23.66 g (Table 1 and Fig. 6).

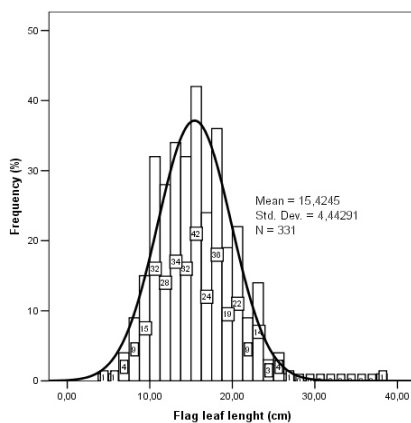


Fig. 3. General distribution of flag leaf blade length values of perennial ryegrass plants (cm).

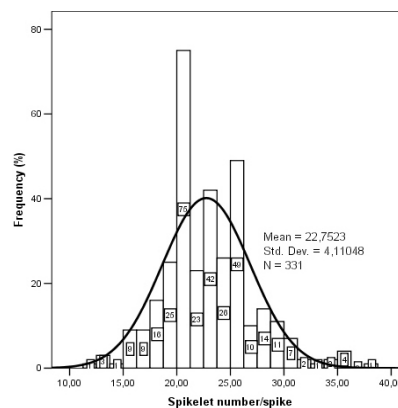


Fig. 4. General distribution of spikelet numbers of perennial ryegrass plants.

IV – Conclusions

The coefficients of variation of the measured values of different characters on 331 plants was calculated below the 30%, except for internode length. A large variation was observed among the plant varieties since Middle Black Sea Region is one of the important gene centers. The results obtained from the study are quite promising for releasing new cultivars to be used for

pasture improvement, forage cultivation and green area establishment. Considering all observations and assessments, 20 plants for hay production, 26 plants for pasture improvement and 35 plants for recreational areas were found out as promising and were selected for further breeding studies. As the plants were harvested at full seed ripening date, the regrowth pattern could not be observed satisfactorily.

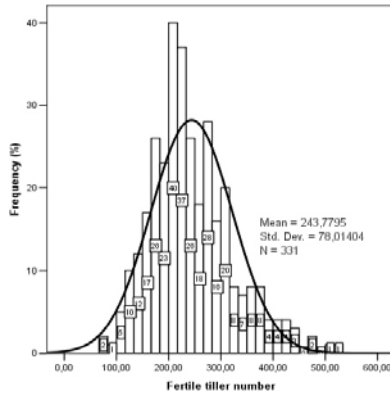


Fig. 5. General distribution of fertile tiller numbers of perennial ryegrass plants.

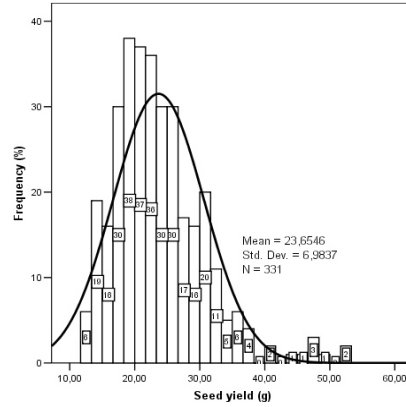


Fig. 6. General distribution of seed yield values of perennial ryegrass plants (g).

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