

Characterization of crested wheatgrass populations for plant maturity and associated physiological and morphological traits

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Abstract

Crested wheatgrass (*Agropyron cristatum* L.) is a drought tolerant, winter hardy grass adapted to the Northern Great Plains and Intermountain regions of North America. A disadvantage of this species is that matured plants are coarse and unpalatable for grazing cattle. The mature plants also have low leaf-to-stem ratio and high fiber concentration. The aim of this study was to evaluate and characterize crested wheatgrass germplasm for flowering time, plant maturity and related forage traits. A collection of 45 crested wheatgrass populations from 20 different countries were established in a spaced field nursery in Saskatoon, Canada in 2014 using a randomized complete block design with four replications. In 2015 to 2017, days to heading, plant height, leaf-to-stem ratio, forage DM yield, crude protein (CP), neutral detergent (NDF) and acid detergent (ADF) were measured, and leafiness and plant vigor were scored at vegetative and flowering stages. All measured traits differed significantly ($P \leq 0.05$) among populations. Days to heading showed a positive correlation with ADF ($r=0.18$, $P<0.01$) and NDF ($r=0.16$, $P<0.05$) but negative correlation association with CP concentration ($r=-0.44$, $P<0.0001$), forage dry matter yield ($r=-0.24$, $P<0.0001$), plant height ($r=-0.21$) and leaf-to-stem ratio ($r=-0.12$, $P<0.01$). Selection for later maturity in crested wheatgrass may lead to reduction in plant height, forage DM yield and leaf-to-stem ratio; however, several adapted breeding lines from the Saskatoon breeding program, had later maturity and relatively high forage yield and leaf-to-stem ratio. According to the unweighted pair group method with arithmetic mean (UPGMA) and principal component analysis (PCA), the 45 crested wheatgrass populations were grouped into three main clusters according to the agro-morphological and nutritive value.