The Effect of Annual Weather on Spring Grass Phenological Development

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Key words : temperate , phenological development , climatic conditions , primary growth

Introduction Phenological development of grasses differ across years , and among species and their cultivars . This study was conducted to compare phonological development among five grass species under field conditions during active spring growth . These temperate C_3 grasses include : *Lolium perenne* L ., *Phalaris arundinacea* L ., *Bromus inermis* Leyss ., *Festuca arundinacea* Schreb . and *Phleum pratense* L .

Materials and methods Pure stands of each species and their cultivars were grown on a highly fertility loam (chernozem) ; average climatic conditions (last forty years) to the middle of June-precipitation 227 .1 mm , T-sum of mean daily temperatures 1244 .5℃ , sum of sunny hours per day 889 .2 hours . Individual shoots of grasses (n=30) were randomly selected from the pure stands and tagged with plastic ribbon . Phenological measurements were made 8 times in 4-8 day intervals during the primary growth between mid-April and early June . Data recorded on each shoot were : extended shoot height (ESH) , number of dead leaves per shoot (NDL ; a leaf was considered dead if more than half of the leaf lamina from the tip was withered) , lamina length (LL) of the live leaves . Calculations include : number of leaves developed per shoot (NL) , number of active leaves (NAL) per shoot , sum of active leaf lamina lengths per shoot (SALL) , index of leafiness (IL) , ratio of SALL to ESH , which is used as an indicator for the leafiness . Data were analyzed using SPSS software .

Results and discussion The climate index for grass growth (Vinczeffy 1991) showed weather differences across years (Figure 1) . Annual precipitation had the greatest effect on grass growth differences among years (Nagy 2007) . The experimental years may be considered as rainy , somewhat rainy , extremely rainy and reasonably dry for 2004 , 2005 , 2006 and 2007 , respectively . Temperature conditions and the sunny hour accumulation were more balanced than rainfall in the experimental years . However , both sum of temperature and sum of sunny hours were remarkably greater in 2007 compared to the other experimental years . There were great significant differences in the mean phenological development of temperate grasses between experimental years (Table 1) . Phenological development of grasses was advanced in 2006 , and remarkably depressed in 2007 . The highest relative differences expressed as a percentage to the lowest value in the years were 88% , 39% , 43% , 52% , 92% and 41% for ESH , NL , NDL , NAL , SALL and IL , respectively .

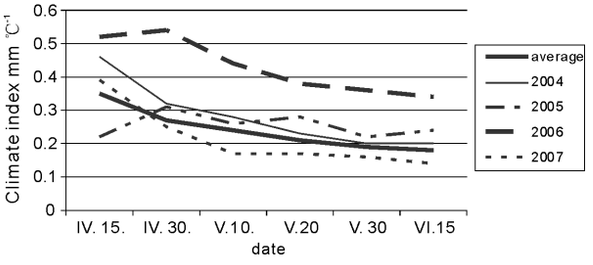

Figure 1 *The climate index for grass growth .*

Table 1 *Results of phenological development .*

Mean	2004	2005	2006	2007	Mean	LSD5%
ESH	67 ,04	60 ,08	78 ,81	41 ,76	61 ,95*	4 ,91
NL	6 ,86	6 ,32	7 ,07	5 ,08	6 ,32*	0 ,43
NDL	1 ,24	1 ,27	2 ,00	1 ,39	1 ,47*	0 ,56
NAL	5 ,61	5 ,05	5 ,07	3 ,69	4 ,85*	0 ,44
SALL	117 ,26	109 ,68	105 ,53	60 ,86	98 ,11*	12 ,59
IL	2 ,01	1 ,93	1 ,42	1 ,56	1 ,73*	0 ,34

* $P<0.001$

Conclusion During the spring grass phenological development is weather dependant .

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