Repulsion-Phase Linkage Analysis of Tetraploid Creeping Bentgrass (Agrostis Stolonifera L.)

S. E. Warnke
USDA-ARS

N. Chakraborty
University of Wisconsin

G. Jung
University of Wisconsin

The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

Proceedings Editor: D. A. McGilloway

Publisher: Wageningen Academic Publishers, The Netherlands

Repulsion-phase linkage analysis of tetraploid creeping bentgrass (*Agrostis stolonifera* L.)

S.E. Warnke[1], N. Chakraborty[2] and G. Jung[2]
[1]*USDA-ARS, National Arboretum, Washington, D.C. 20002, USA E-mail: warnkes@ars.usda.gov*
[2]*University of Wisconsin, Department of Plant Pathology, Madison, WI USA*

Keywords: linkage analysis, repulsion-phase linkage, genetic markers

Introduction Creeping bentgrass is a cool-season grass species primarily used on golf course greens, tees, and fairways because of its tolerance of low mowing heights and recuperative ability. Creeping bentgrass is tetraploid and outcrossing and has been characterized as having bivalent chromosome pairing through cytogenetic analysis (Jones, 1956) and disomic inheritance based on the inheritance of isozyme markers (Warnke *et al*., 1998). The objective of this experiment was to evaluate the extent of repulsion-phase linkages of single dose AFLP type markers in a creeping bentgrass mapping population and to infer chromosome pairing behaviour based on the ratio of coupling to repulsion-phase linkages.

Materials and methods A creeping bentgrass mapping population of 90 plants was used to evaluate the ratio of coupling to repulsion phase linkages using the computer program MapMaker 3.0. AFLP type DNA fragments were separated on an ABI 3730XL machine and scored using the computer program Genographer. Two hundred markers segregating in a 1:1 ratio in the progeny were scored and mapped. The ratio of coupling to repulsion-phase linkages was determined as described by Qu and Hancock (2001).

Results The markers scored for each parent in the mapping population and the number of coupling and repulsion phase linkages are shown in Table 1. The ratio of coupling to repulsion phase linkages is very close to a 1:1 ratio in both parents of the mapping population indicating disomic inheritance.

Table 1 Markers scored and the ratio of coupling to repulsion-phase linkages.

	Markers scored	AFLP: S-SAP	Distorted segregations	Repulsion linkages MaxR=37.5cm	Coupling linkages MaxR=37.5cm	p-value 1:1
Female 549	149	123 26	33(22%)	299	302	0.90
Male 372	117	96 21	28(24%)	123	127	0.80

Conclusions The results of this study provide support for genome wide disomic inheritance in tetraploid creeping bentgrass. If polysomic inheritance was operating the ratio of coupling to repulsion-phase linkages would not be expected to fit the exhibited 1:1 ratio and tight repulsion phase linkages would not be present. A thorough understanding of inheritance in tetraploid creeping bentgrass will facilitate the development of new cultivars with improved biotic and abiotic stress resistance.

References

Jones, K. 1956 Species differentiation in *Agrostis* II. The significance of chromosome pairing in the tetraploid hybrids of *Agrostis canina* subsp. Montana Hartm., *A. capillaris* Sibth. and *A. stolonifera* L. J. Genet. 54:377-393.

Qu, L., and Hancock, J.F. (2001) Detecting and mapping repulsion-phase linkages in polyploids with polysomic inheritance. Theor Appl Genet 103:136-143.

Warnke, S.E., Douches, D.S., and Branham, B.E. (1998) Isozyme analysis supports allotetraploid inheritance in tetraploid creeping bentgrass (Agrostis palustris Huds). Crop Sci. 38:801-805.