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APPLICATION OF RFLP. MARKERS IN BACKCROSS BREEDING

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BACKGROUND

The utilization of the resources present in wild and primitive germ plasm may be encouraged, if the number of backcrosses necessary for transfer of genes for traits of interest to a desirable recipient is reduced. This may be achieved by introducing selection in the early generations based on markers permitting an unambiguous characterization of single individuals on a genotypic level. RFLP markers meet this requirement by having properties such as codominant expression, absence of pleiotropic effects and influence by environmental conditions. Furthermore, the probability of finding multiple alleles by this method is high, thereby implying effeciency in distinguishing genotypes (Beckmann and Soller 1986, Paterson *et al.* 1988, Tanksley *et al.* 1989).

After backcrossing, the percentage of recipient genome is expected to average 75% in the first backcross generation (Bc_1), but theoretically this percentage may vary from 50 to 100 among the progeny (Hillel *et al.* 1990). Taking advantage of this variation, it may be possible to select the individuals with maximal similarity to the recipient line, thereby increasing the efficiency of backcrossing, provided the criterion for similarity is reliable.

This may be expected to be the case if an adequate number of markers is utilized, a number dependent on the degree of recombination in the chromosome segments adjacent to the markers, and if these markers are randomly scattered throughout the genome.

AIM

The present investigation is undertaken with the purpose of estimating the value of RFLP markers as criterion for genomic similarity to the recipient line in a backcross breeding program.

MATERIALS AND METHODS

The backcross progeny involved in this study is derived from two cross combinations, the donors being a primitive Ethiopian and Nepalese barley line and as recipient in both cases the modern variety 'Corgi'. All belong to the species *Hordeum vulgare* L. The lines and the variety differ from each other with respect

to resistance properties. Thus, the primitive lines each contain new effective specific resistance genes towards powdery mildew, *Erysiphe graminis* f.sp. *hordei*. Only these genes are to be transferred, as the primitive lines in other respects are inferior to the 'Corgi'.

The DNA probes available include both cDNA and gDNA probes. The cDNA probes (kindly provided by AFRC Institute of Plant Science Research, Cambridge) are derived from mRNA isolated from wheat, *Triticum aestivum* L. Each of the 14 probes are localized to different chromosome arms.

At Risø, a barley genomic library has been constructed using the restriction enzyme *PstI*. Until now, 25 RFLP markers have been selected and mapped.

RESULTS

Prior to the analysis of the progeny, the cDNA and gDNA probes are screened on the parents, in order to select the probes which show polymorphism in the particular plant material and at the same time enables a distinction of the homo and heterozygotes in the progeny. So far 12 probes have proven useful. On the basis of the selected probes, the different degrees of similarity to the recipient line among the individuals in the Bc_1 populations are to be assessed by classifying these according to their number of RFLP loci homozygotic for the alleles of the recipient line. DNA has been extracted from the Bc_1 plants and, at the present analysis for the selected probes is carried out.

The value of the predictions made about similarity to the recipient line on the basis of RFLP data for the individuals is to be assessed by comparison to data for phenotypic similarity. The evaluation of the phenotype by means of qualitative characters scored on Bc_1 plants and segregating progeny is in progress. Subsequently, quantitative characters will be evaluated, involving both segregating progeny and dihaploid lines. For selected Bc_1 individuals, these evaluations will be supplemented with analysis for another set of markers and for total protein differences.

By different groupings on the basis of the RFLP data, this study may give information upon several aspects, such as the number of RFLP markers required, an eventual advantage of certain markers, the applicability of cDNA versus gDNA probes, the influence of the specific donor, and the significance of the presence of the resistance gene.

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