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Joint Meeting of the European *Prunus* and Apple Genome Mapping Groups, East Malling, UK, May 1991

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Abstract

A joint meeting of the *Prunus* and Apple Genome Mapping Groups was held at East Malling in May 1991. These two informal groups of workers, from six and seven European institutes respectively, plan to collaborate on constructing genetic maps of molecular markers and agronomic characters in *Prunus* and in apple.

There were 14 short reports, of recent progress in isoenzyme linkage studies in *Prunus* and apple or of DNA techniques useful for FRLP and RAPD analysis and an account of possible grants for collaborative projects. Topics discussed included problems of linkage analysis and the different strategies adopted by the two groups, as well as future collaboration. Proceedings, consisting of abstracts of the presentations and summaries of the discussions, are available from East Malling.

An example of the work reported is the first linkage detected in cherry *(Prunus avium)* between a morphological character, albinism, and a biochemical marker, *Gpi-2*, the gene coding for glucose phosphate isomerase II.

Introduction

A meeting to discuss genetic mapping in *Prunus* and apple was held at East Malling in May 1991. The 20 or so participants, from France, Germany, Greece, Holland, Italy, Spain and the United Kingdom, were members of the *Prunus* and Apple Genome Mapping Groups.

The Prunus and Apple Genome Mapping Groups

The *Prunus* group, which has met once before, in Florence in 1990, is an informal group of fruit breeders and molecular biologists from six European institutes, who plan to share material and exchange information to facilitate the construction of a linkage map for *Prunus*. The collaborating institutes, working variously on cherry, peach and almond, are:

INRA Bordeaux, France
INRA Orleans, France
ISF Rome, Italy
IRTA Cabrils, Spain
HRI East Malling, U.K.
HRI Littlehampton, U.K.

Pere Arus, IRTA Cabrils, 08348 Cabrils (Barcelona), Spain, is the coordinator; he is keen to hear from other workers interested in collaborating.

The Apple group, which has not met before, is a similar group of workers from seven institutes collaborating on the European Apple Genome Mapping Project:

INRA Angers, France
IGP Ahrensburg, Germany
PI Naoussa, Greece
CPO Wageningen, Holland
ICA Bologna, Italy
HRI East Malling, U.K.
HRI Wellesbourne, U.K.

The coordinator is Graham King, HRI Wellesbourne, Warwickshire CV35 9EF, U.K., and he would too like to hear from further possible collaborators.

The Meeting

The meeting lasted two days and consisted of 15 presentations and several discussion sessions. There were short reports of the participants' recent achievements and future plans in isoenzyme and linkage studies in *Prunus* and apple or of DNA techniques useful for RFLP and RAPD analysis, together with an account of possible sources of funding for collaborative projects. Joint discussions concentrated on problems of linkage analysis and on the differences in strategy of the

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Table 1. Segregation of *Prunus avium* progeny 'Bradbourne Black' x 'Merton Late' for albinism and *Gpi-2*.

	Numbers of seedlings observed (and expected[1])		
	green *C-*	albino *cc*	Total
Gpi-2 aa	2 (12)	12 (4)	14 (16)
Gpi-2 ab	33 (24)	1 (8)	34 (32)
Gpi-2 bb	16 (12)	0 (4)	16 (16)
Total	51 (48)	13 (16)	64 (64)

goodness of fit of single gene segregations:

	observed	expected	χ^2	d.f.	p
C-: cc	51:13	3:1	0.75	1	0.39
Gpi-2 aa:ab:bb	14:34:16	1:2:1	0.38	2	0.83

goodness of fit of observed cosegregation of *c* and *Gpi-2* with that expected in absence of linkage: $\chi^2 = 38.04$, d.f. = 2, $p < 0.001$.

[1]Expected if independent cosegregation of 3 green : 1 albino and 1*aa*:2*ab*:1*bb*.

two groups, particularly in connection with the types of progeny chosen for analysis. In addition, the groups had separate discussions to plan their collaborative programmes.

The *Prunus* group intends to concentrate initially on two F_2 progenies, one derived from selfing a hybrid of 'Early-gold' peach by 'Texas' almond and the other from selfing the cherry cultivar 'Stella.' These progenies are of no particular agronomic interest but are theoretically very amenable to linkage computations. They will be analysed for isoenzyme and DNA markers so that an outline genetic map of *Prunus* markers can be constructed. Then various intraspecific progenies of peach, almond and cherry, designed to segregate for agronomically useful characters, will be analysed to detect linkages with markers so that the agronomic genes can be located on the map.

The apple group plans to work on four F_1 progenies derived from crosses of the commercial cultivars 'Northern Spy' and 'Fiesta' with two breeders' selections of intraspecific origin. The parents are known to possess various agronomically important monogenic and quantitative traits and have been characterised for a series of isoenzymes. These progenies will be analysed for cosegregation of the various monogenic and quantitative traits with isoenzyme and DNA markers to establish a linkage map containing agronomic and molecular characters.

Genome maps, recording isozyme and DNA markers linked with agronomic and other non-molecular traits, could greatly aid the fruit breeder. For example, molecular markers could be useful for preselection, the marker rather than the agronomic trait being selected soon after germination, and for tagging recessive alleles in heterozygotes.

The proceedings of the meeting, consisting of abstracts of the talks and summaries of the discussions, have been compiled and are available from the authors at East Malling (3).

Cherry Linkage Studies at East Malling

Our work on cherry linkage at East Malling illustrates the type of progress reported at the meeting.

We breed cherry *(Prunus avium)* at East Malling, not only as a tree fruit and as a rootstock, but also as a timber tree for farm woodlands: the U.K. government is encouraging the plant-

ing of broadleaved timber trees on farm land. To save time and space in seedling assessment we are keen to establish early selection techniques. Such techniques depend either on physiological correlations or on genetic linkages, but in cherry few of either have been established.

To investigate genetic linkages, controlled crosses have been made at East Malling to produce large progenies segregating for various morphological characters and for various isoenzymes. These are being analysed, and interesting results have been obtained with the progeny resulting from the cross 'Bradbourne Black' x 'Merton Late' (Table 1). This segregated for seedling colour in the ratio of 3 green : 1 albino, both parents presumably being heterozygous for the recessive lethal albino allele *c* (2). Among the isoenzymes for which it segregated is glucose phosphate isomerase II, coded for by the gene *Gpi-2*: both parents are heterozygous *ab* and the seedlings show the expected ratio 1*aa* : 2*ab* : 1*bb*. However, when the cosegregations are examined, it is clear that nearly all the albino seedlings have the *aa* genotype. This indicates that albinism and *Gpi-2* are closely linked with the albino allele coupled to *aa* in both parents: the recombination fraction was calculated by the maximum likelihood method as r = 0.05 ± 0.03.

Linkages between isoenzymes in *P. avium* have been reported by Santi and Lemoine (4), namely *Got-1* with *Lap-1* (r = 0.3 ± 0.02) and *Lap-1* with *Me-1* (r = 0.05 ± 0.07). And many years ago Kerr (1) concluded that ripening season and fruit firmness are linked (r = 0.125). However, the linkage of *c* and *Gpi-2* is the first reported linkage of a morphological character with an isoenzyme in *P. avium*.

Acknowledgements

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Comparison of Micropropagated and Runner Propagated Strawberry

A recent report on the performance of 'Olympus' strawberries propagated through tissue culture or by runners showed that yield of micropropagated plants was not greater than plants from runners. Significant variability existed from this subclones from micropropagation with the highest yielding subclone. However after runner propagation for 4 years, selected subclones showed no difference in yield. The difference among subclones of 'Olympus' were not stable and were most likely transient response to the micropropagation environment and not due to genetic changes.

From: Moore et al. 1991. Field Performance of 'Lympus' Strawberry Subclones. *HortScience* 26(2):192-194.

Oregon Apple Cultivar Evaluation Needs Your Help

Since our spring weather was unusually warm and sunny, we have the biggest crop of apples in the history of our variety trial. In addition, every variety is maturing about three weeks earlier than normal. All this means that our all-"emeritus" research team, the Duncans, Cecil Compton and myself are very busy collecting and storing over 500 samples for evaluation.

In the five years since we started to evaluate fruit from our apple variety trial we have acquired 250 clones, most of which are named varieties. Of these, 44 were evaluated and removed, about 90 are fruiting, and 116 have not yet fruited. We must keep a clone in our collection for 5 or 6 years for evaluation. Thus, if we collected no additional clones, we would need another six years, or until 1997, to complete evaluations of what is already on hand. Perhaps you are among the many contributors who have made progress to this point possible. If so, thank you very much!

To continue the excellent progress we have achieved, we must depend on your help. Donated funds will be partnered with state support in the form of the field laboratory and cold storage on the Lewis Brown Horticultural Research Farm. Please send a check payable to the *Agri*cultural Research Foundation today in care of Dr. Robert L. Stebbins, Department of Horticulture, Oregon State University, Corvallis, OR 97331.