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POTATO LEAFHOPPER RESISTANCE - THE BEGINNING

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was necessary. Experiments showed that as the density of hairs on leaf veins increased, the potato leafhopper damage decreased. When the density of hairs exceeded 3 per mm2, no feeding damage was observed. Also, glandular-haired plants were non-preferred by potato leafhopper and alfalfa weevil adults.

During the final two years of the Purdue breeding program, there were still two major hurdles to overcome before releasing a glandular-haired variety. First, the percentage of resistant plants in the most desirable population (81IND-2) had to be increased. Secondly, regrowth of 81IND-2 plants after cutting had to be improved. At this point the decision was made at Purdue to release the germplasm to commercial breeders for varietal development. In 1986, 5 grams of 81IND-2 seed were made available to any breeder upon request. In 1995, we learned that Forage Genetics in West Salem, WI had developed at least one glandular-haired variety with resistance to the potato leafhopper. We also learned from Dr. Mark McCaslin, the alfalfa breeder for Forage Genetics, that the glandular hair character expressed in their varieties traced primarily to 81IND-2. According to an article in "Hay and Forage Grower" by Joan Olson, nine commercial companies will be releasing glandular-haired varieties with resistance to the potato leafhopper in 1997.

In general, mechanical or biophysical forms of resistance, such as glandular hairs, effect a wider range of insects than biochemical forms of resistance. While the new glandular-haired varieties are being released for potato leafhopper resistance, it is important to consider what impact these varieties might have on other alfalfa insect pests and their natural enemies. As was discussed above, 81IND-2 was also resistant to the alfalfa weevil. Research at Kansas State and Purdue showed that the glandular-haired relatives of alfalfa were also resistant to the pea aphid and alfalfa seed chalcid. Consequently, it would not be surprising to see reduced insect activity in general on the new glandular-haired alfalfa varieties.

Once an insect-resistant variety is released, there is an immediate concern regarding the durability of resistance, or how long the variety lasts before it is overcome by a new insect biotype. There are several factors suggesting that glandular-haired alfalfa may be very difficult for potato leafhopper to overcome. First, biophysical/mechanical forms of resistance are usually more difficult for an

insect to overcome than biochemical forms of resistance. Secondly, it is generally more difficult for an insect to overcome two sources of resistance (simultaneously) than one source of resistance (Antibiosis: exudate kills immature stages, and Nonpreference: adults do not prefer to rest on plants). Thirdly, the potato leafhopper has a wide host range, and is not forced to feed on alfalfa. Therefore, selected potato leafhopper individuals able to develop on resistant glandular-haired alfalfa will have the opportunity to mate with unselected individuals having developed on plants other than glandular-haired alfalfa. The greater the chance of selected and unselected matings, the lower the selection pressure, the lower the probability of biotype development. Finally, potato leafhopper populations developing on alfalfa in the Midwest will be killed by winter temperatures. Therefore, if isolated individuals begin to expand into populations that can survive on glandular- haired alfalfa, they would be eliminated (this would not be true for the southern U.S.). Given these four factors suggesting that the glandular-haired resistant alfalfa should be very durable with regard to the potato leafhopper, it should also be kept in mind that there are very few cases where insects were not able to overcome a resistant plant or toxic insecticide. We at Purdue are excited about the potential interactions between alfalfa insects and the new glandular-haired varieties of alfalfa.

Please refer any questions or general observations regarding glandular-haired alfalfa to:

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