Hooded *left* **and normal awned Atlas barleys.**

Hooded Atlas Barley

studies indicate development of hooded barley competitive with awned doubtful

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Dual-purpose — hay and grain — Hooded Atlas barley was created from a lineage of about 5,000 plants grown during an 18-year period.

Hoods—trifurcate awns—are relatively soft structures and give the heads a distinctive beardless appearance.

Barleys with this character are found principally in the high Himalaya valleys of Asia. In America hooded introductions and their hybrids have been comparatively unproductive. Their best performance has been in western states at high elevations. Most of this acreage is cut for hay.

To produce Hooded Atlas, selected plants were backcrossed for 10 generations and then 103 selected lines were blended. This procedure resulted in two almost identical forms, near isogenic except that one was hooded and the other was awned—bearded. With these, a precise study of the effects of the hooded character could be made.

In 60 paired tests of Atlas and Hooded Atlas—made at Davis from 1953 to 1957—Atlas had a mean yield of 2,813 pounds of grain per acre and Hooded Atlas produced 24% less grain. All three of the components of yield—heads per unit area, grains per head, and individual grain weight—were lower for Hooded Atlas. The reduction in kernel weight accounted for 56% of the decreased yield. Furthermore, the kernels from Hooded Atlas were less symmetrical and required 8% more bin space to store a given tonnage.

In 45 comparisons at the Tulelake Field Station, Atlas produced 5,568 pounds of grain per acre, and Hooded Atlas produced 13% less. The lessened disparity between the yields of the two types at Davis and at the higher elevation of Tulelake was statistically significant.

Lower yield was not the only economically undesirable trait observed in Hooded Atlas. Structurally the hood facilitated entry inside the hulls of floral infecting disease spores of the barley stripe and loose smut fungi, thus increasing the severity of these seedborne diseases. Also such foliar diseases as net blotch or scald were found to develop on and discolor—brown spot—the hulls of Hooded Atlas much more commonly than those of Atlas.

These studies show that a hooded Atlas barley competitive with awned barley in grain yield and quality probably can not be produced for any of the important barley producing areas in California.

The studies also illuminate two obscure features of plant breeding. Multiple action by a gene, called pleiotropy, which conditions changes in form, production and quality, is seldom encountered. Likewise a gene-environment interaction involving the effect of altitude is unusual.

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The above progress report is based on Research Project No. 176, of cooperative research by the Crops Research Division, Agricultural Research Service, of the United States Department of Agriculture and the University of California.

These trials were designated as *1-55*, *2-55*, *3-55* and *4-55*. One plot was not carried through to completion. The following year, three field plot locations were selected for further trials. Only one of these was completed and designated as *1-56*.

In Trial *1-55*, the soil type was Ripperdan fine sandy loam, where the previous two crops were cotton. Severe leaf scorch became evident several weeks before harvest on the check plots. Later, leaf scorch became severe on the plots receiving the lower rates of potash.

Trial *2-55* was on the same soil type as *1-55*, with previous crops of potatoes and barley. Deficiency symptoms developed at the same time and under the same circumstances as in *1-55*.

Trial *3-55* was on a Grangeville fine sandy loam that had a history of potato production in three of the previous four years. The soil potassium level was low, and the leaf potassium reached a low level comparable to Trials *1-55* and *2-55*. In contrast to the two trials on Ripperdan soil, the response to potash was not significant in Trial *3-55*. The expected response to potassium was not obtained, probably due to soil conditions peculiar to the location, or factors more limiting to production than the level of potassium.

The soil type in Trial *4-55* was Ripperdan-Dinuba fine sandy loam located on the westerly edge of the Ripperdan soil area. The addition of potash raised the potassium leaf content in the treated plots, but there was no increase in yield. The soil content was in the mid-high range and no potassium deficiency leaf symptoms were observed.

In Trial *1-56*, the soil type was Ripperdan fine sandy loam, centrally located in the Ripperdan soil area. Soil tests indicated a level of 57 ppm replaceable potassium. Severe leaf scorching was observed in the check and low potash plots prior to harvest. Although there were marked responses to potash at this location, the nitrate-nitrogen leaf levels reached the low range in all plots early in the season. Had this nitrogen requirement been met, there is a good possibility that yields realized would have been higher.

In these trials, differences between broadcast and side-dress fertilizer treatments were not significant. A rate of 200 pounds potassium oxide per acre appeared to be the best rate under the conditions of the trials. Leaf analysis suggested, however, that the optimum level of potassium in the plant was not being maintained from mid-season to harvest in the low potash areas, even where 400 pounds potassium oxide per acre was applied.

Forrest Fullmer of the American Potash Institute assisted in the above studies.

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