THE TRANSGRESSIVE INHERITANCE OF REACTION TO
FLAG SMUT, EARLINESS OF HEADING, PARTIAL
STERILITY, AND STIFFNESS OF GLUMES IN A
VARIETAL CROSS OF WHEAT

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This paper reports a case of transgressive inheritance of several
characters in a varietal cross. The study was carried from F1 to F5
of a cross between a Chinese variety, Pathology 4592, and an Aus-
tralian variety, Nebawa. The two parents were practically immune to
flag smut, Urocystis tritici Koern., at Nanking. They were also
medium early, easy in thrashing, and fully fertile. In F2, F3, F4, and F5
of the cross there were some plants susceptible to flag smut, some
heading earlier than either parent, some partially sterile, and some
having stiff glumes.

MATERIALS AND METHODS

The parental variety, Pathology 4592, was selected from a farmer's variety at
Wei-hsien, Shantung, and Nebawa was obtained directly from Australia. These
two varieties were tested by the Pathology Division of the University of Nanking
for their reaction to flag smut in 1926–1933, inclusive. They were free from smut
infection throughout the nursery tests. A half mou (about ½ acre) of each was
grown in 1933 in addition to the nursery tests. No smut was found in the plat of
4592, although two smutted plants were found in Nebawa. The former, therefore,
can be considered as immune and the latter as nearly immune to the biological
strains of flag smut found at Nanking. However, both varieties showed a small
percentage of flag smut in the tests in Honan and Shensi.

The methods of smut inoculation used previously by the Division of Plant
Pathology of the University of Nanking were followed. The fungous spores were
supplied every year by the Pathology Division. It was stated that the smut was
collected originally from a farmer's field in Nanking in 1925. The spores supplied
for this study originated from a single row harvested in 1927 in the hope of having
one biological form. For inoculation each envelope containing wheat grains and
smut spores was emptied into a brass dipper, 6 cm in diameter, with holes in the
bottom. The dipper was then shaken vigorously to insure distribution of the spores
on the grain.

In taking notes on smut reaction in this study, the percentage of infection was
based on the number of infected plants. In the F1 progenies, notes were taken on
both plant and culm infection for comparison.

The date of heading was taken for each plant as the tip of the first head emerged
from the auricle of the top leaf.

The hybrids were first made in the spring of 1932. In order to obtain adequate
data on date of heading in F1 and to increase the size of the population in F2,
further crosses were made in the spring of 1934 and that of 1936. The F1 plants
were grown together with the parents in the greenhouse prior to 1937, but in 1937

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