



Inheritance of lateral spikelet fertility in a barley cross of Glacier with Compana
by Dale G Smeltzer

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirement for the degree of Master of Science in Agronomy at Montana State College
Montana State University
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Abstract:

A cross was made of Glacier, a six-rowed variety, with Compana, a two-rowed variety of barley. the F₃ segregation for spike row character and lateral spikelet fertility is reported* the two-rowed versus six-rowed character was found to be controlled by a single genetic factor pair, the segregation ratio was three non-six-rowed types to one six-rowed type* Two Intermediate spike type# were found in F₂, some having infertile lateral spikelets, sad others had some seed set in the laterals. These appeared In F₂ in a ratio of three infertile to one fertile, there were two types of segregations observed in F₃ from the infertile intermediate types. One group gave the two parental types plus infertile intermediates, and the other group produced the parental types plus both infertile end fertile intermediates, the same as the F₂ segregation* those classed as fertile intermediates in F₂ segregated to produce two-rowed, fertile intermediate end six-rowed spike types* The complete segregation ratio in F₃ far the two characters was as follows: - 4 true breeding two-rowed*: segregating# two-rowed, infertile Intermediate, and six-rowed :4 segregating# tee-rowed, infertile intermediate, fertile intermediate, and six-rowed:2 segregating# two-rowed, fertile intermediate, and six-rowed:4 true breeding six-rowed*

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by

DALE G. SMELTZER

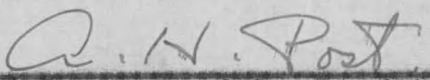
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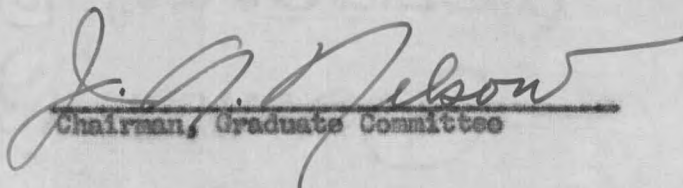
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TABLE OF CONTENTS

	Page
LISTING OF TABLES AND FIGURE	4
ABSTRACT	5
INTRODUCTION	6
REVIEW OF LITERATURE	7
MATERIALS AND METHODS	12
EXPERIMENTAL RESULTS	
F ₃ Classification	14
Two-rowed <u>versus</u> six-rowed	15
Fertility of lateral spikelets	15
DISCUSSION	19
SUMMARY	23
LITERATURE CITED	25

LIST OF TABLES

	Page	
Table I	F_3 Classification of 328 Families of Glacier x Compans Barley on the Basis of Lateral Spikelet Fertility	14
Table II	Calculation of Goodness of Fit to an Expected 1:2:1 Segregation Ratio for Two-rowed: Intermediate six-rowed Spike Type from Classified F_3 Families of Glacier x Compans Barley	15
Table III	Calculation of Goodness of Fit to an Expected 1:2:1 Segregation Ratio for Fertility of Lateral Spikelets in F_3 from F_2 's of Glacier x Compans Barley Having Intermediate Spike Types	16
Table IV	Calculation of Goodness of Fit to a 4:2:4:2:4 Segregation Ratio for Spike Type and Fertility in F_3 of Glacier x Compans Barley	17
Table V	F_2 Phenotypes and Genotypes and F_3 Breeding Behavior for Fertility of Lateral Spikelets of 328 Families of Glacier x Compans Barley	18

FIGURE

Figure 1	Spike types obtained from a cross of Glacier with Compans Barley: 1 True two-rowed (Compans) type. 2 Two-rowed type with enlarged lateral florets. 3 Infertile intermediate 4 Fertile intermediate 5 True six-rowed (Glacier) type.	13
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ABSTRACT

A cross was made of Glacier, a six-rowed variety, with Compana, a two-rowed variety of barley. The F_3 segregation for spike row character and lateral spikelet fertility is reported.

The two-rowed versus six-rowed character was found to be controlled by a single genetic factor pair. The segregation ratio was three non-six-rowed types to one six-rowed type.

Two intermediate spike types were found in F_2 , some having infertile lateral spikelets, and others had some seed set in the laterals. These appeared in F_2 in a ratio of three infertile to one fertile. There were two types of segregations observed in F_3 from the infertile intermediate types. One group gave the two parental types plus infertile intermediates, and the other group produced the parental types plus both infertile and fertile intermediates, the same as the F_2 segregation. Those classed as fertile intermediates in F_2 segregated to produce two-rowed, fertile intermediate and six-rowed spike types.

The complete segregation ratio in F_3 for the two characters was as follows: - 4 true breeding two-rowed:2 segregating; two-rowed, infertile intermediate, and six-rowed:4 segregating; two-rowed, infertile intermediate, fertile intermediate, and six-rowed:2 segregating; two-rowed, fertile intermediate, and six-rowed:4 true breeding six-rowed.

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INTRODUCTION

Barley is an important cereal crop in Montana and in the United States. There was a greatly increased demand for the grain during World War II, both as a feed for an accelerated livestock production program and as a source of ethyl alcohol. In general, this demand was met. There is still a need for well adapted, high producing, disease resistant varieties of barley in many areas of the State and Nation.

Genetic principles are invaluable to plant breeders in their efforts to develop superior varieties, not only in barley but in all crop plants. In both the six-rowed barleys, Hordeum vulgare L., and the two-rowed types, H. distichum L., there are seven pairs of chromosomes. This relatively small number is advantageous in inheritance studies.

Plants of the genus Hordeum are normally self-pollinated and intra- and inter-specific crosses are easily made. At each node of the rachis there are three single-flowered spikelets. The fertility of the two lateral spikelets is the principal factor used in differentiating the species H. vulgare and H. distichum. The mode of inheritance of lateral spikelet fertility when varieties of these two species are crossed has been studied by a large number of investigators with results varying with the parent material used.

In this paper the F_3 segregation of a cross of a six-rowed variety, Glacier, and a two-rowed variety, Compana, is reported and this segregation is interpreted in terms of the genetic factors involved.

REVIEW OF LITERATURE

The mode of inheritance of the two-rowed versus six-rowed character has been studied by numerous workers whose researches have extended over a period of more than half a century. Daane (3) ^{1/} in 1931 and Leonard (12) in 1942 have summarized the literature on the character and they report all investigators as having found a single factor difference between these two types. However, the fertility of the intermediate types and the breeding behavior of these forms has not been constant. Previous workers have been at wide variance in their explanations of the type of segregation which they observed.

Biffen (1) in 1905 reported that in several crosses involving six-rowed and non-six-rowed types, a ratio of 3:1 resulted in all cases, with the less fertile type being dominant. In no case did he observe any lateral spikelet fertility in the F_1 . Griffee (8) in 1925 reported a single factor difference for two- versus six-rowed type but made no mention of lateral spikelet fertility. Daane (3) reported that Neathy, McGregor and Buckley also found the segregation to be governed by a single factor pair. Hor (11) in 1924 made no mention of any fertility factors in his study but merely gave an observed ratio of 3:1 for non-six-rowed versus six-rowed type. Tedin and Tedin (17) in 1929 reported only a single factor difference between the two- and six-rowed character. They tried to explain this variance with that of von Ubisch's work of 1916 on the basis of a different method of classification.

^{1/} Numbers in parentheses refer to literature cited on page 25.

