



Short Communication

Inheritance of early growth habit and spike row number in barley (*Hordeum vulgare* L.)

B. Ramesh and Mukesh Kumar Sharma

Department of Agricultural Botany, Ch. Charan Singh University, Meerut 250 004

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Seeds of six barley accessions obtained from International Centre for Agricultural Research in the Dry Areas (ICARDA), Syria were utilized in intraspecific crosses. Of the six accessions, one belongs to cultivated (*ssp. vulgare*) and the rest are wild spontaneums (see Table 1). The cultivated has a 6-rowed spike (spikelets

Table 1. Characteristics of materials used in intraspecific crosses of *Hordeum vulgare*

Sub-species	Accession No.	Country of origin	Spike type	Early growth habit	Boot leaf	Days to heading
<i>vulgare</i>	EC 312415	Tunisia	6-rowed	Erect	Long,broad	108
<i>spontaneum</i>	EC 312419	Jordan	2-rowed	Spreading	Short,narrow	100
-do-	EC 312420	Jordan	-do-	-do-	-do-	98
-do-	EC 312422	Jordan	-do-	-do-	-do-	99
-do-	EC 312424	Turkey	-do-	-do-	-do-	98
-do-	EC 312425	Turkey	-do-	-do-	Long,broad	99

on central as well as lateral rows are fertile) and erect plant habit while the spontaneums are 2-rowed (spikelets on central rows only are fertile) and show spreading growth habit in the early stages of plant development. The spontaneums were crossed with *vulgare* and the F_1 s were raised in the field and data on various agro-morphological characters in F_1 hybrids and their respective parents were recorded at appropriate stages. The F_1 s were harvested individually and F_2 populations were raised as individual plant progeny rows. The F_2 segregation patterns for early growth habit and spike row number (fertility of spikelets on lateral rows) were recorded in addition to other characters. The observed data were compared to calculated theoretical ratios and tested for goodness of fit using χ^2 test. The segregation patterns were confirmed in F_3 .

The cultivated *vulgare* parent exhibited erect growth habit while the wild spontaneums showed spreading growth in the early stages of plant development. The early growth habit of the F_1 hybrids

was intermediate with semi-spreading nature (Table 2)

Table 2. Character expression in F_1 hybrids

Character	Parents		F_1
	<i>vulgare</i>	<i>spontaneum</i>	
Early growth habit	Erect	Spreading	Semi-spreading
Boot leaf	Long,broad	Short, narrow	Long, medium
Spike row number	Six	Two	2-rowed*
Tiller number	20-23	28-38	28-32
Days to heading	108-109	98-100	98-101

*A few fertile lateral florets observed

and there was clear-cut segregation in the F_2 into three distinct phenotypic classes of erect, semi-spreading and spreading types. The observed segregation data in the F_2 populations (Table 3) showed a good fit to a ratio of 1 erect : 2 semi-spreading : 1 spreading and thus indicate that the character is monogenically controlled (Table 3). The segregation in F_3 confirmed this ratio. Similar result was reported by Murty and Jain [2]. They observed the dominance of semi-spreading habit over the erect habit in the F_1 of the cross K-251 (erect) \times EB-438 (semi-spreading). The segregation in F_2 and F_3 generations clearly indicated that a single gene controlled this character.

The spike was 6-rowed in cultivated (*vulgare*) lines with complete fertility on lateral florets. In wild spontaneums, it was 2-rowed with spikelets on central rows only being fertile. The F_1 s showed the development of fertile seed on lateral florets in considerable numbers (15-27%). In F_2 populations there was segregation for spike row number, and three distinct classes of 2-rowed, intermediates like the F_1 and 6-rowed types were recorded. The F_2 segregation data in all cases (Table 4) gave a good fit to 1:2:1 ratio of 2-rowed, intermediate and 6-rowed types, respectively. The segregation in F_3 confirmed this ratio. The results thus indicate that this character is also monogenically controlled.

Table 3. Inheritance of early growth habit in barley

Cross		Number of plants in F ₂			X ²	P
		Erect	Semi-spreading	Spread ing		
EC-312415	Ob*	16	20	11	0.96	0.70-0.50
× EC-312415	Ex.	14	28	14		
EC-312419	Ob.	12	26	14	0.15	0.95-0.90
× EC-312415	Ex.	13	26	13		
EC-312420	Ob.	5	18	9	1.50	0.50-0.30
× EC-312415	Ex.	8	16	8		
EC-312422	Ob.	16	21	7	3.77	0.20-0.10
× EC-312415	Ex.	11	22	11		
EC-312425	Ob.	11	19	18	4.12	0.20-0.10
× EC-312415	Ex.	12	24	12		

* Ob = Observed segregation, Ex = Expected values (1:2:1)

Table 4. Inheritance of fertility on lateral florets of spike in barley

Cross		Number of plants in F ₂			X ²	P
		2-rowed	Inter-mediate	6-rowed		
EC-312415 × EC-312419	Ob*	15	22	19	3.14	0.30-0.20
	Ex.	14	28	14		
EC-312419 × EC-312415	Ob.	13	23	16	1.04	0.70-0.50
	Ex.	13	26	13		
EC-312420 × EC-312415	Ob.	10	22	12	0.18	0.95-0.90
	Ex.	11	22	11		
EC-312422 × EC-312415	Ob.	10	20	14	1.09	0.70-0.50
	Ex.	11	22	11		
EC-312424 × EC-312415	Ob.	18	23	7	5.12	0.10-0.05
	Ex.	12	24	12		
EC-312425 × EC-312415	Ob.E	14	27	21	2.61	0.30-0.20
	x.	15.5	31	15.5		

* Ob. = Observed segregation; Ex. = Expected values (1:2:1)

Some of the earliest reports on hybrids in barley discussed the results of crossing 2 rowed, 6-rowed and intermediate types on the development and fertility of lateral florets. The genetic basis of row number has been attributed by some to one factor pair with 2-rowed

type being more or less dominant, while others had considered it to be determined by two factors [3]. Ubisch [cf. 3] assumed that the expression of 'Z' was responsible for the 2-rowed condition and that the gene 'W' produced the intermedium factor in a hypostatic condition. Harlan and Hayes [4] also obtained true breeding intermediate types in F₃ generation and explained their results by assuming that the six rowed variety carried two factors, one for the 6-rowed condition and the other for the intermedium condition and was hypostatic to the former. According to some workers, fertility on lateral florets seems to be determined by allelic series of three [5] or four genes. Some even found association of earliness or its influence on fertility of lateral florets [6]. The results of the present study, however, clearly indicate that one gene pair controls spike row number in barley.

On the basis of the present results it is concluded that early growth habit and spike row number in barley are monogeneically controlled and the wild condition is incompletely dominant over cultivated.

References

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