M. Feldman

Table 6

The activity of the catalase enzyme in sprayed alfalfa leaves

Data of samples	O_2, mm³/minute	
1st cutting		
Control	438.00	$SD_{5\%} = 26.13$
Treatment 1	486.67	$F_{value} = 140.28^*$
Treatment 2	626.57	
2nd cutting		
Control	421.22	$SD_{5\%} = 38.81$
Treatment 1	500.42	$F_{value} = 81.55^*$
Treatment 2	640.68	
3rd cutting		
Control	395.07	$SD_{5\%} = 57.44$
Treatment 1	639.29	$F_{value} = 45.86^*$
Treatment 2	547.95	

* Significant at $P < 0.1\%$.

J. ~~Sto~~
Sutka

Prepared at the University of Horticulture, Department of Chemistry and Department of Agronomy.

M. FEHÉR, K. KÁDÁR, Z. SZABÓ, G. GOMBKÖTŐ, O. LOHONYAI, I. PAIS

References

DOBROLYUBSKY, O. K. (1961): The effect of titanium as a trace element on some biochemical processes in grapes. Tr. II. Mezhvuz. Soveshch. po Mikroelem. 156–162.

FEHÉR, M. (1975): A titán jelentősége a kertészeti növények tápanyagforgalmában (Role of titanium in the nutrient turnover of horticultural plants). Doctor's dissertation, University of Horticulture, 89.

FRENYÓ, V. (1961): Eljárás és eszköz gázképződéssel járó folyamatok vizsgálatára (Technique and instrument for the study of processes involving gas formation). Patent description. OTH. 150. 379; F.S.-542.

LOWRY, O. H.—ROSEBROUGH, N. J.—FARR, A. L.—RANDALL, R. J. (1951): Protein measurement with the Folin phenol reagent. J. Biol. Chem., **193**, 265–275.

PAIS, I. (1974): Objektív kémiai vizsgálatok néhány tápelem szerepének felderítésére kertészeti növényekben (Objective chemical experiments to clarify the role of some nutritive elements in horticultural plants). Doctor's dissertation, Hungarian Academy of Sciences, 183.

PAIS, I.—FEHÉR, M. (1975): Mikroelemet tartalmazó permetezőszer kertészeti és mezőgazdasági növények termésében a beltartalmi értékek, elsősorban a cukor-tartalom növelésére (A spray containing microelements to increase the value of components, primarily the sugar content, in the fruits of horticultural and agricultural crops). Patent description. OTH. A 01 N 5/00

PAIS, I.—FEHÉR, M.—CORNIDES, I. (1975): A titán(IV) meghatározása növényi mintákban (Determination of titanium-(IV) in plant samples). Kert. Egyet. Közl., **XXXIX**, 213–217.

PAIS, I.—FEHÉR, M.—FARKAS, E.—SZABÓ, Z.—CORNIDES, I. (1977): Titanium as a new trace element. Comm. Soil Sci. Plant Anal., **8/5**, 407–410.

~~**Rutskaya**, S. I.—Рутская. С. И. (1971): Титан, его влияние, на физиологические процессы и продуктивность захардой свеклы. В.: Значение новых форм минеральных удобрений в увеличении производства сахарной свеклы. Киев. 254—266.~~

~~**Tonkonozhenko**, E. V.—**Khlyupina**, M. I. (1974): Titanium in soils and plants of the Krasnodar Territory. Pochvoved., **3**, 38—45.~~

THE EFFECT OF TEMPERATURE ON GROWTH HABIT IN HOMOEOLOGOUS GROUP 5 OF TRITICUM AESTIVUM

The method of aneuploid analysis has been used for studying the genetics of growth habit in common wheat for nearly a quarter of a century (**Unrau** 1950, **Sears** 1953, **Kuspira—Unrau** 1957, **Knott** 1959, **Morrison** 1960, **Tsunewaki—Jenkins** 1961, **Tsunewaki** 1966, **Halloran—Boydell** 1967, **Rajki—Rajki** 1969, **Law** 1971, 1972, **Law—Worland** 1973). It is unanimously agreed, that the chromosomes of homoeologous group 5 are essentially responsible for spring versus winter habit.

This paper reports on the effect of different temperature treatments on the growth habit of monosomics for homoeologous group 5 of Chinese Spring (CS), and the F_1 monosomics produced by crossing these with the winter wheat varieties Rannyaya 12 (Ran 12) and Mironovskaya 808 (Mir 808).

The materials used in this experiment were CS 5A, 5B and 5D monosomics and disomics, together with the F_1 hybrids formed by crossing them with Ran 12 and Mir 808. In the crosses, which were carried out in the nursery, the female parents were CS monosomic and disomic lines, the seed samples of which had been obtained from the Plant Breeding Institute, Cambridge in 1966. The vernalisation requirement of the winter variety Ran 12 is fairly short, whereas that of Mir 808 is long.

The chromosome number of the parents and the F_1 hybrids was determined from root-tip mitosis, and was checked at first metaphase meiosis. Spike morphology also helped to distinguish monosomics.

Seed germination and the pretreatment of the seedlings were carried out in a phytotron chamber, with an 8-hour night temperature of 5°C and a 16-hour day temperature of 10°C. After the 14-day pretreatment, the seedlings were transferred to three phytotron chambers maintained at different temperatures. The night/day temperatures in the three chambers were 5°/10°C, 10°/15°C and 15°/20°C respectively. In all three chambers the daylength was 16 hours, the illumination intensity 10,000 lux, and the relative humidity 65% by day and 80% at night.

The pots were distributed at random in the chambers. For each treatment 5 plants were available. The number of days required for shooting and heading served as a criterion of growth habit. The day on which the growth rate changed from linear to logistic was taken as the shooting date. The day on which approximately half the spike had emerged from the covering leaves was recorded as the heading date. Two-factor analysis of variance was used to evaluate the data collected (**Sváb** 1973).

After the 14 day pretreatment at 5—10°C, under artificial conditions, the CS plants headed completely at all temperatures, while at 15—20°C 50% of the Ran 12 plants and 60% of the Mir 808 plants failed to head (Table 1). The number of days required for heading in CS and F_1 disomics increased as the temperature fell. CS 5A and 5D monosomics at 5—10°C and 15—20°C, and F_1 5A and 5D monosomics at all temperatures deviated significantly from the disomics. This difference was greatest at 15—20°C. In the F_1 generation, the 5D monosomics headed later than the 5A at all temperatures; the 5B monosomics did not differ significantly from the corresponding disomics.

Table 1

The effect of temperature on the number of days required for heading in homoeologous group 5

	Temperature (°C)	Monosomic lines	Days required for heading		
			CS	F_1 CS×Ran 12	F_1 CS×Mir 808
14 days pretreatment at 5—10	5—10	5A	+ 6.8***	+13.8***	+18.0***
		5B	+ 1.6	+ 2.2	— 2.4
		5D	+ 4.0*	+24.2***	+23.4***
		Disomics	110.2	121.2	129.4
		♂		141.5	181.2
	10—15	5A	+ 3.2	+11.4***	+15.2***
		5B	— 3.0	— 2.2	+ 1.6
		5D	+ 2.8	+20.8	+25.6***
		Disomics	88.4	97.0	99.6
		♂		131.6	174.8
	15—20	5A	+11.6***	+13.2***	+23.0***
		5B	+ 1.2	+ 5.4*	— 1.2
		5D	+14.0***	+42.2***	+39.4***
		Disomics	74.4	87.0	96.8
		♂		124.5^{+}	178.5^{++}

(+) later or (—) earlier heading of monosomics as compared to the corresponding disomics.
* $P < 0.05$ $^{+} = 50\%$ of plants not headed
*** $P < 0.001$ $^{++} = 60\%$ of plants not headed

Table 1 also demonstrates that the number of days required for heading in the F_1 disomic hybrids CS×Ran 12 and CS×Mir 808 were closer to the corresponding data for CS than to those of the winter varieties, but dominance could not be considered as complete.

The number of days required for shooting was calculated as a percentage of that required for heading (Table 2). The data indicate that for the CS disomic this ratio remained constant at 5–10°C and 10–15°C, but increased at 15–20°C. In the case of both the F_1 disomics and the winter varieties this value increased with the rise in temperature. On comparing the F_1 monosomics, the lowest value was found for 5B and the highest for 5D.

Thus the number of days required for shooting and heading is influenced by both the genotype and the temperature. Nor can the interaction of these two factors be ignored, since it gave rise to a mean square deviation, significant on the basis of the F-test.

*

Prepared at the Agricultural Research Institute of the Hungarian Academy of Sciences, Martonvásár.

J. SUTKA, E. RAJKI

Table 2

The effect of temperature on the relationship between days for shooting and days for heading (%)

	Temperature (°C)	Monosomic lines	CS	F_1 CS × Ran 12	F_1 CS × Mir 808
14 days pretreatment at 5—10	5—10	5A	56.9	65.9	63.8
		5B	56.7	58.5	57.9
		5D	58.3	65.1	65.6
		Disomics	57.9	58.4	62.3
		♂		53.0	64.6
	10—15	5A	63.5	67.9	70.2
		5B	61.6	65.8	70.0
		5D	66.9	69.6	71.1
		Disomics	57.9	68.7	69.7
				65.3	70.9
	15—20	5A	70.9	76.3	78.5
		5B	62.2	69.1	77.0
		5D	70.6	78.6	83.0
		Disomics	65.0	73.3	76.0
		♂		71.5	77.3

References

HALLORAN, G. M.—BOYDELL, C. W. (1967): Wheat chromosomes with genes for vernalisation response. Can. J. Genet. Cytol., **9,** 632—639.

KNOTT, D. R. (1959): The inheritance of rust resistance. IV. Monosomic analysis of rust resistance and some other characters in six varieties of wheat including Gabo and Kenya Farmer. Can. J. Plant Sci., **39,** 215—228.

KUSPIRA, J.—UNRAU, J. (1957): Genetic analysis of certain characters in wheat using whole chromosome substitution lines. Can. J. Plant Sci., **37,** 300—326.

LAW, C. N. (1971): Rep. Plant Breed. Inst., Cambridge, England, 1970, 88—89.

LAW, C. N. (1972): The analysis of intervarietal chromosome substitutions in wheat and their first generation hybrids. Heredity, **28,** 169—179.

LAW, C. N.—WORLAND, A. J. (1973): Chromosome substitutions and their use in the analysis and prediction of wheat varietal performance. Proc. 4th Int. Wheat Genet. Symp., Columbia, USA.

MORRISON, J. W. (1960): The monosomic analysis of growth habit in winter wheat. Z. Vererbungslehre, **91,** 141—151.

RAJKI, E.—RAJKI, S. (1969): Monosomic analysis of growth habit in autumnization process. Fifth Congress of the Eucarpia, Milan, 1968. Genetica Agraria, 43—47.

SEARS, E. R. (1953): Nullisomic analysis in common wheat. Amer. Nat., **87,** 245—252.

SVÁB, J. (1973): Biometriai módszerek a kutatásban (Biometric research methods). Mezőgazdasági Kiadó, Budapest, 517.

TSUNEWAKI, K. (1966): Comparative gene analysis of common wheat and its ancestral species. II. Waxiness, growth habit and awnedness. Jap. J. Bot., **19,** 175—229.

TSUNEWAKI, K.—JENKINS, B. C. (1961): Monosomic and conventional gene analysis in common wheat. II. Growth habit and awnedness. Jap. J. Genet., **36,** 428—443.

UNRAU, J. (1950): The use of monosomes and nullisomes in cytogenetical studies of common wheat. Sci. Agric., **30,** 66—89.