

Gene pair	Phase	A B	A b	a B	a b	Recombination %	
						<u>±</u>	st. error
o cl	R	101	56	33	1	16.1	± 4.5
o gl	C	146	11	9	25	13	± 1.8
cl gl	R	98	36	57	0	very	low

From these data it appears that the mutant is likely to be located distally to \underline{gl}_1 .

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1. Analysis of variation of growth rate of maize root tips cultured in vitro.

The technique of root cultures in vitro appears to be a useful tool for the study of the genetic control of continuous variation, because it offers the possibility of a rigorous control of the environmental factors. This technique offers the possibility of carrying out experiments for studying the effects of the gene action which control continuous variation at the biochemical level (Ottaviano and Zannini, 1965).

The main purpose of this work is to study the genetic control of variation of growth rate of maize root tips in order to see if this material is suitable for genetic biometrical studies. In this experiment five inbred parents and all their possible F_1 's, reciprocals included, have been considered. The biometrical analyses are those of diallel crosses as indicated by Jinks and Hayman (1953), Hayman (1954) and Jinks (1954).

The growth rate, expressed as weight after two weeks, has been studied on two different media: 1) Standard (Ottaviano and Zannini, 1965) and 2) standard with nicotinamide. For each genotype four repetitions on both media have been accomplished. The whole experiment has been completely randomized.

Table 1
Hayman Analysis

Items	S S	D F	M S	F	P
a	362.3354	4	90.5838	7.0161	<0.001 ***
b ₁	56.0211	1	56.0211	4.3391	0.01-0.05*
b ₂	17.8075	4	4.4519	<1	>0.20
b ₃	115.6640	5	23.1328	1.9066	>0.05
b	189.4926	10	18.9493	1.4677	>0.05
c	231.8063	4	57.9516	4.4886	<0.001 ***
d	234.6017	6	39.1003	3.0285	0.01-0.001**
t	1018.2360	24			
N	0.6751	1	0.6751	<1	
Na	11.7900	4	2.9475	<1	
Nb ₁	0.0341	1	0.0341	<1	
Nb ₂	20.2012	4	5.0503	<1	
Nb ₃	45.2350	5	9.0470	<1	
Nb	65.4703	10	6.5470	<1	
Nc	22.5512	4	5.6378	<1	
Nd	21.1386	6	3.5231	<1	
Nt	121.9501	24			
Total	1140.8612	49			
Residual	2065.7280	160	12.9108		
* : P 0.05 ** : P 0.01 *** : P 0.001					

The results are as follows:

- (1) The factorial analysis (Jinks and Broadhurst, 1963) shows that the variability of the character is genetically controlled. The differences between the genetical contributions of the five parents are significant ($P < 0.05$) whether we consider the variance between male or the variance between female array means.
- (2) Hayman analysis (table 1) shows that:
 - (i) there is significant additive variation (item a);
 - (ii) there is significant directional dominance variation (item b_1); since the overall F_1 mean is higher than the parental one, this means that dominance increases the growth rate;
 - (iii) there are significant differences between reciprocal crosses (items c and d);
 - (iv) there is no evidence of an effect of nicotinamide (items N).
- (3) More information has been obtained by analyzing the regressions W_r/V_r and W_r'/W_r (Jinks and Hayman, 1963; Jinks 1954 and Hayman, 1958). This analysis (figure 1) carried out on the experiment on standard medium shows that:
 - (i) There is significant complete dominance (regression W_r'/W_r significant, $P < 0.05$);
 - (ii) There is no evidence of interallelic interaction.

The same analysis carried out on the data from the experiment with the second medium (Standard + nicotinamide) gives a strong indication of interallelic interaction. The comparison of parental means with F_1 means indicates that the amount of heterosis is increased from 8.69 to 14.41. However, a complete repetition of the experiment is needed in order to strengthen these nicotinamide effects.

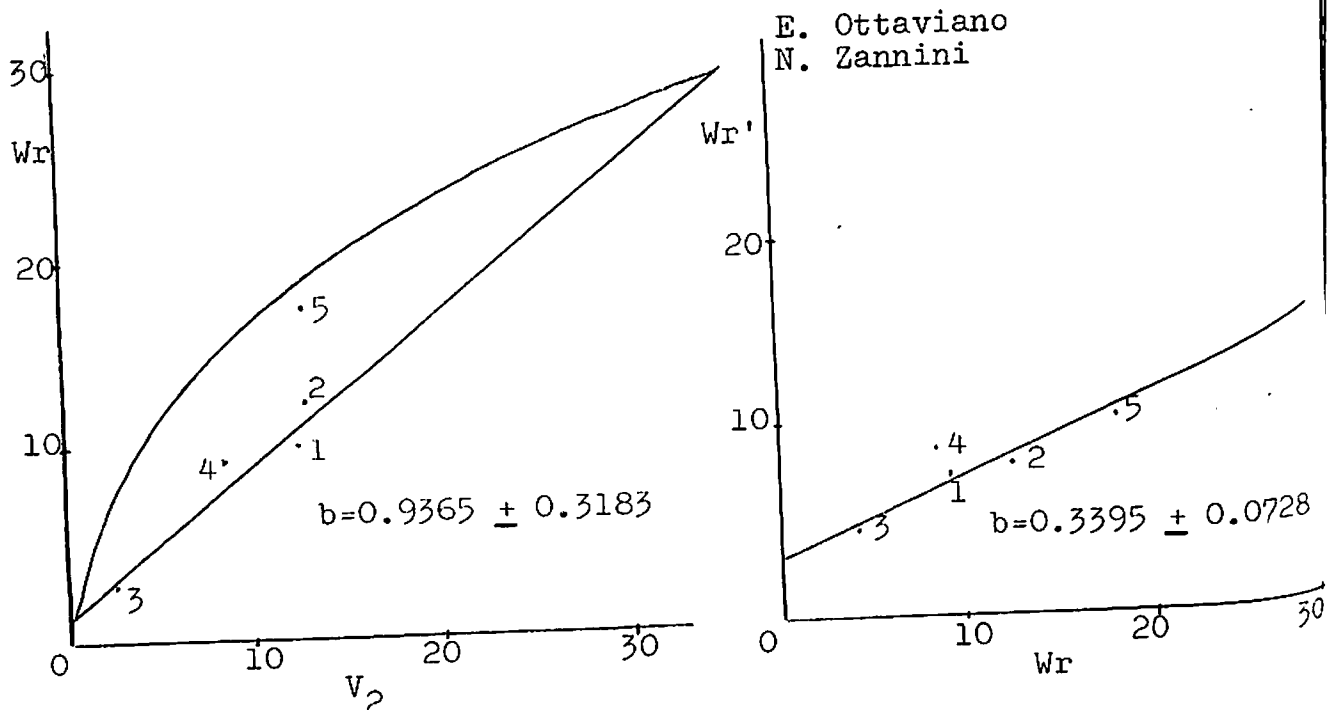


Fig. 1. W_r/V_r and W_r'/W_r graphs