GENETIC VARIABILITY AND PERFORMANCE OF IN-VITRO PROPAGATED BANANA PLANTS

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In vitro propagation of banana was initiated in Israel eleven years ago by Dr. Reunveni at the Agricultural Research Institute.

In a few years the propagation techniques were adopted by commercial laboratories, and at the present high quality in-vitro propagated plants ok are freely available. Nevertheless, only about 10% of the bananas being planted in Israel last year were of in-vitro propagated plants. The reasons for the apparently limited use of these plants were: a) The permanent occurrence of off-tipes, b) The uncertainty about their perfomance, c) Some, indications about a higher susceptibility of in vitro plants to some pests and virus infection.

The purpose of the study reported here was to describe the type of mutants ocurring among in vitro propagated plants, to find their rate of ocurrence and to evaluate the variability and performance of the normal in vitro plants as compared with conventional banana plants.

METHODS

In vitro (INV) and conventional (CON) banana plants of the cvs. "Williams" and "Grand Nain" were compared under field conditions. Experimental plantations, designed in completely randomized blocks, were established both in spring and summer. Complementary observations were carried out in commercial plantations where INV and CON plants were planted side by side. The INV plants were 15-40 cm in height, with 9-12 green leaves, rooted in 6 liter pots. The CON plants planted in spring - the most common planting time in Israel - were suckers of about 130 cm in height with 18-20 leaves, their lamina being removed before planting. The CON plants planted in summer were corms. Detailed observations regarding type and rate of mutations, morphological characteristics, growth and yield were conducted for the first cycle. Additional information for the 2nd and 3rd cycles was also recorded.

Explain the shorter figure with smaller leaf area at flowering, found in the INV plant. These, in turn, may explain the lower yield of INV plants planted at spring. It should be mentioned however, that using better INV planting material than that used in our experiment, may give better results. As a matter of fact in a more recent observations in

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commercial fields planted in spring similar results for INV and CON plants were obtained.

SUMMER PLANTING: Rate of growth of INV "Williams" plants planted in summer was similar to CON plants, except for the first month after planting, when a higher rate of growth was observed for the INV plants (Fig. 3). The same was found for rate of leaves emission (Fig. 4). Height at flowering and leaf surface were somewhat higher in the INV plants (Table 3). The yield of the INV plants was in about ten percent higher. The same advantage was recorded, again, in the 2nd cycle.

VARIABILITY

Except for the occurrence of off-types, INV plants are more uniform than CON plants (Fig. 5) in most vegetative and reproductive characteristics. They grow in a uniform rate, flower in a short period and their fruit is being harvested in a shorter period. This should be attributed to the physiological and genetic uniformity of the planting material.

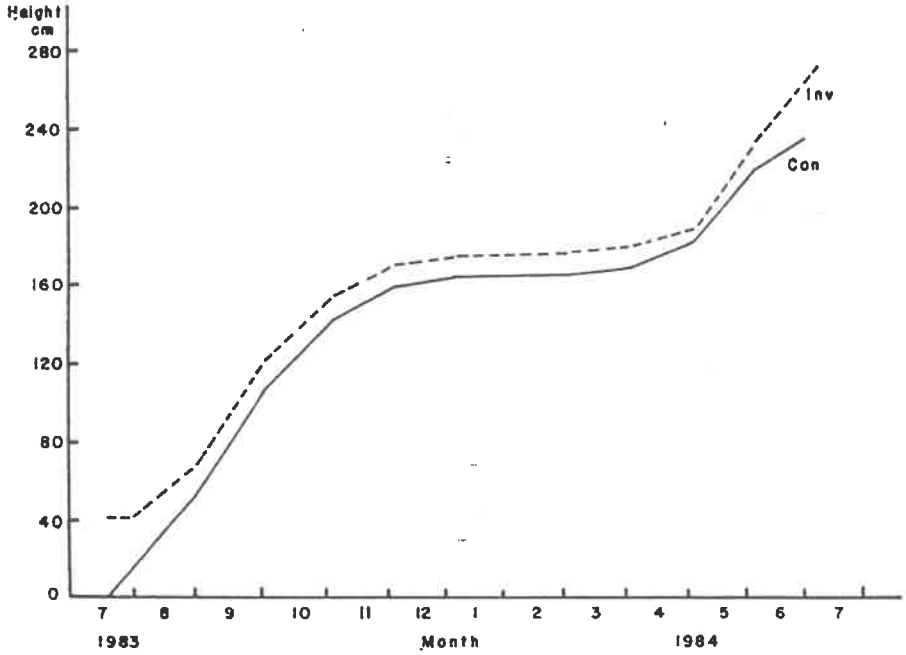

Fig. 3 Growth in Height of Inv and Con Bananas Planted in Summer

CONCLUSIONS

Reducing the rate of off-types occurrence among INV propagated bananas is of great importance for the future use of these plants. At the present a thorough selection should be performed in the nursery, before taking the plants to the field.

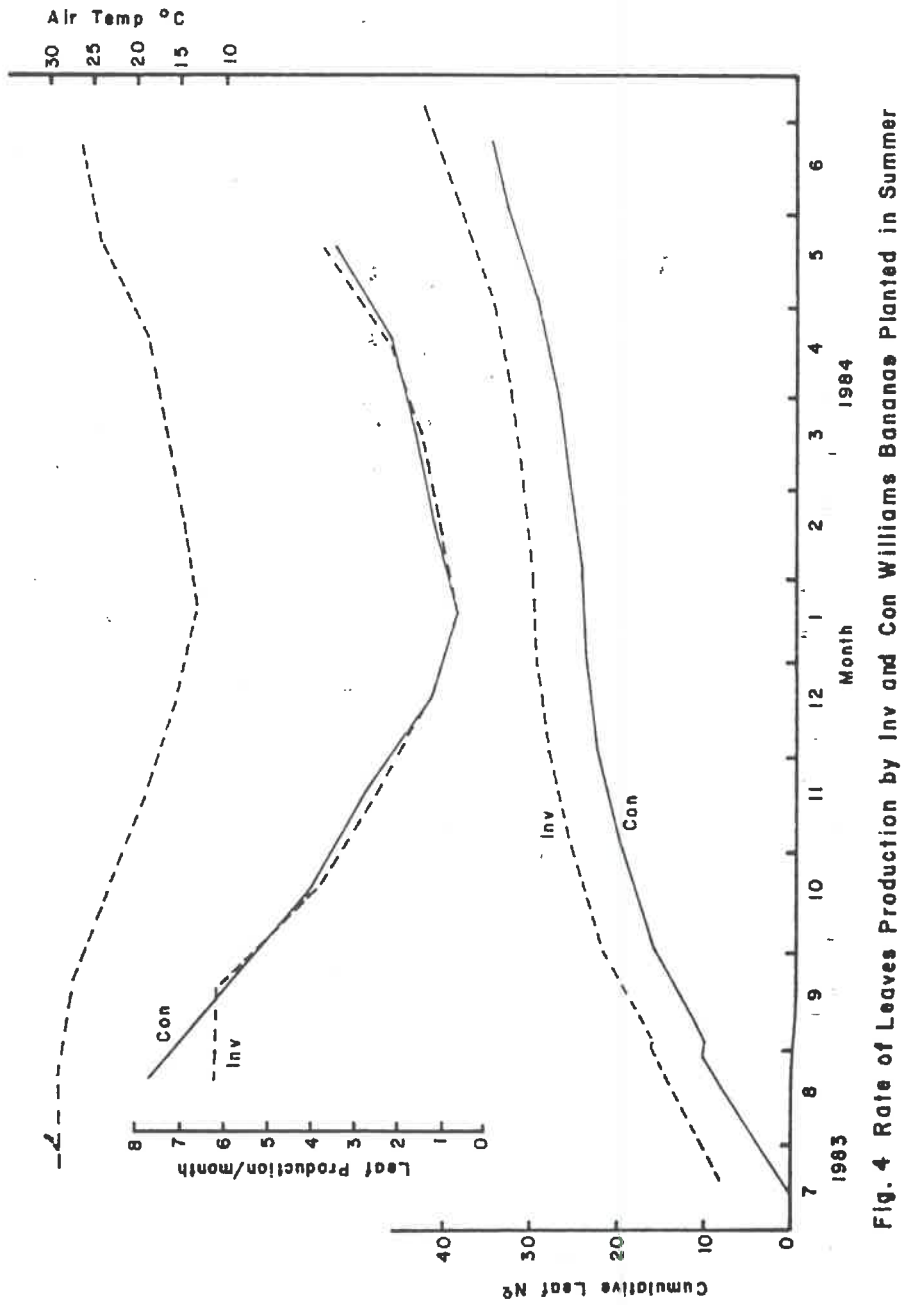

Fig. 4 Rate of Leaves Production by Inv and Con Williams Bananas Planted in Summer

Table 3. Performance of Williams bananas planted summer 1983 (First cycle).The INVplants used were 40 cm in height, the CON plants were corms.

	INV	CON
Days from planting to flowering	351	350
Nº of leaves emerged during that period	34	34
Height at flowering (cm)	268	239
Length of the biggest leaf (cm)	211	202
Width of the biggest leaf (cm)	89	84
Number of hands per bunch	12.2	10.7
bunch length (cm)	81	70
Interval flowering - harvesting (days)	102	98
Bunch weight (kg)	35.1	31.8
Yield (ton/ha)	56	50.8
Bunch weight 2nd Cycle (kg)	36.4	30.7
Yield (ton/ha) 2nd Cycle	79.4	68.4

Ontogenetic and physiological factors affects the performance of INV plants. When well developed plants are being planted at an adequate season, the INV plants may perform equally or even better than CON plants.

The behaviour of INV plants with regard to problems of pests and deseases should be studied separately.

RESULTS AND DISCUSSION

Type of mutants: The most common off-types found among the INV plants were: a) Dwarfed plants (DW), resembling very closely the Dwarf Cavendish bananas. These off-types ocurred both in Grand Nain and Williams. In a local selection named Natan, originated in Dwarf Cavendish, the occurrence of an extra dwarf mutant was recorded. b) Plants with narrow, thick, curled leaves, with streaks, looking like virus-infection (MO). These plants ocurred in all the cvs. propagated in vitro until now, including "Red" (AAA) bananas. c) Plants with reddish color of the leaf petioles and leaf sheaths (RD). This last type ocurred only in "Williams" plants. All the above described off-types traits were found to be transmitted to suckers left for further ratoon crops, and to reoccur when suckers were transfered to a different place. Some more types of mutants were occasionally found in a very small numbers. No off-types were found in the CON plants under observation. Nevertheless, the DW and RD mutants are known to occur, in a very low rate, in commercial plantations. To our experience the MO mutant was not observed in CON plantations.

Rate of off-types occurrence: The rate of off-types occurrence among the INV plants varied, in different plantations, from very few to

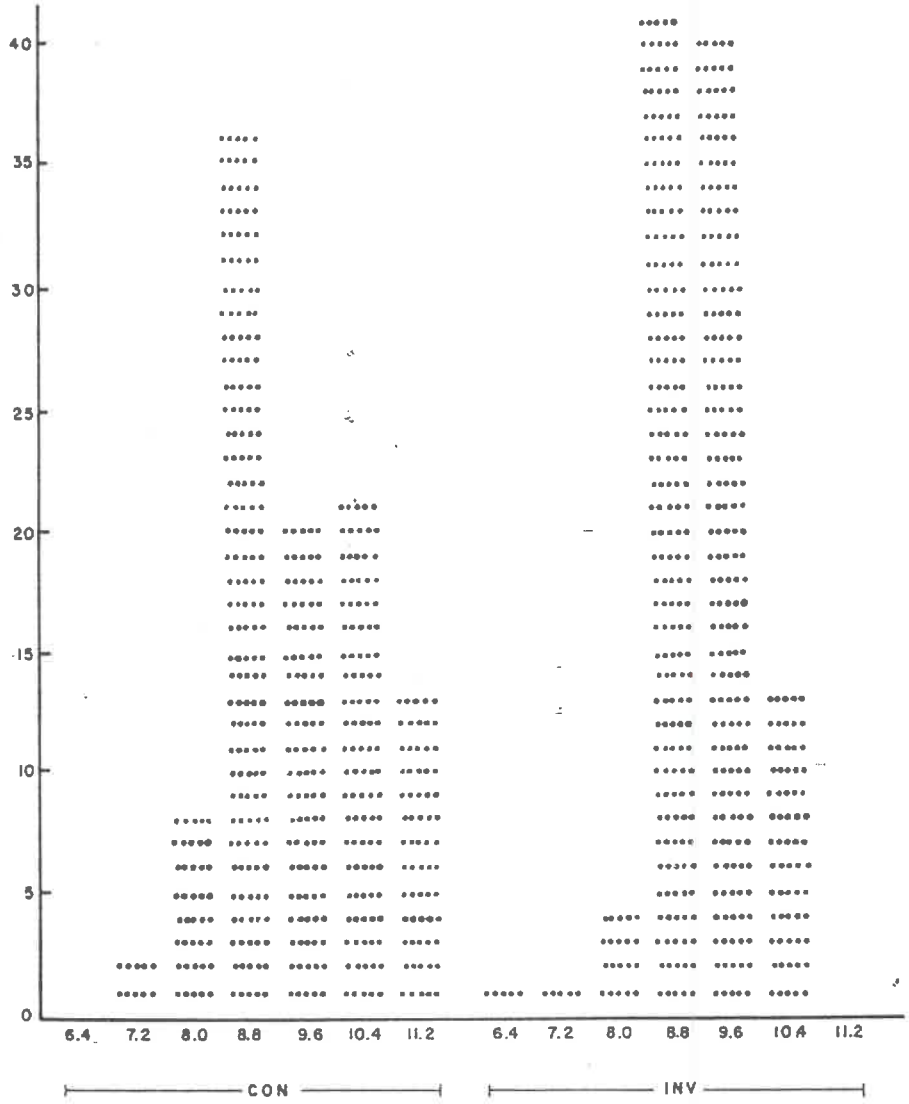

Fig. 5 Distance Between Petides (cm) (Grand Nain, Spring, Plant Crop)

about 20% (Table 1). It was found, however, that a great part of these off-types plants could be identified and discarded when a careful selection is performed in the nursery at the time the plants are fully developed, ready for planting. The plants should be uniform, well grown and of about 30 cm at least in height, in order to perform a reliable selection.

PERFORMANCE

Spring planting: The INV plants grew faster than CON plants (Fig. 1). An average growth of 1.35 cm in height per day during the planting-

Table 1. Off - types occurrence (1983)

Plantation	Clone	Nº of Plants	Off - Types (% of Population)		
			DW	MO	Total
1	Gran Nain	1464	3.4	3.8	7.2
2	Williams	1560	12.3	1.9	14.2
3	Williams	501	2.2	0.2	2.4
4	Williams	896	10.2	0.2	10.3
5	Williams	1492	17.3	1.3	18.6
6	Williams	320	6.6	2.8	9.4
7	Natan*	640	0.6	0.8	1.4
8	Natan*	1660	11.7	0.6	12.3

* Natan - A Local selection, Giant - Cavendish type.

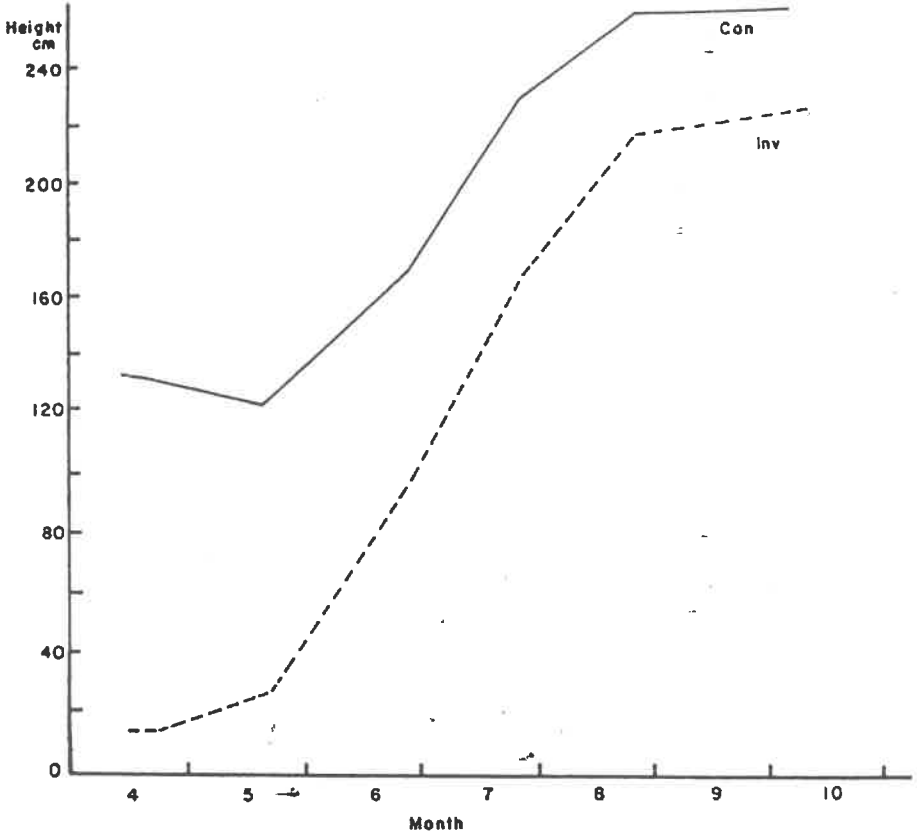

Fig. 1 Growth in Height of Inv and Con Bananas Planted in spring

harvesting period was recorded for the INV plants, as against 0.86 cm per day for CON plants. Rate of leaf emission was also faster in the INV plants (Fig. 2). Both type of plants flowered after the emission of about 40

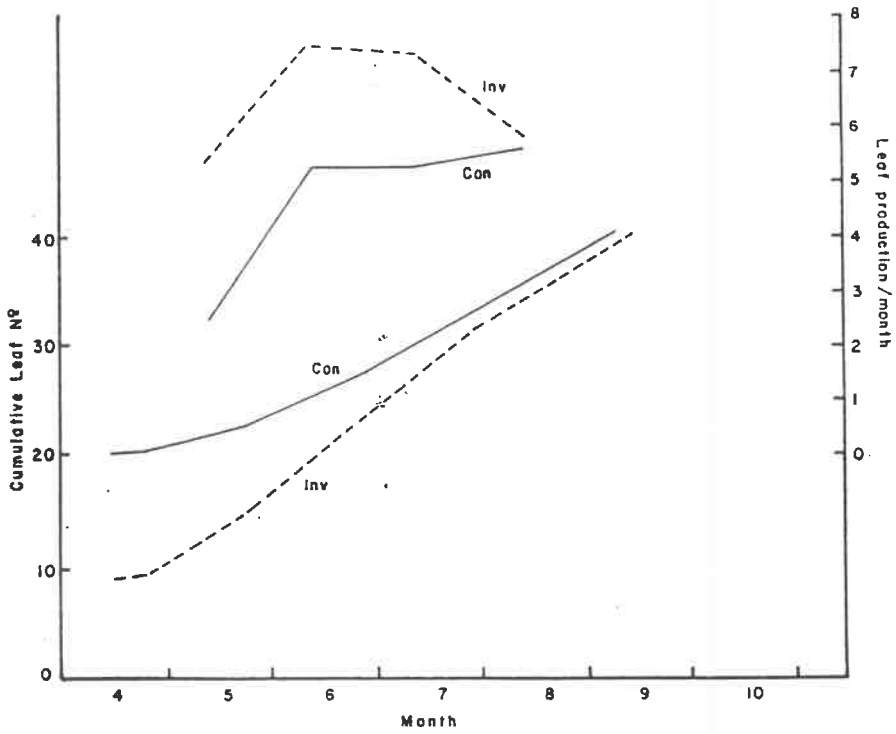

Fig. 2 Rate of Leaves Production by Inv and Con Bananas Planted in Spring

leaves, but leaf length and width was smaller in the INV plants (Table 2). Average flowering date of INV plants was 6 days later than CON plants. Their bunch was somewhat smaller, average bunch weight at harvest was 22.7 kg as compared with 27.6 kg for CON plants, and yield was 27.0 ton/ha as against 32.9 ton/ha. The exceptionally high rate of development may.

Table 2. Performance of Grand Naine bananas planted in spring 1983 (first cycle). The inv plants used were 15 cm in height, the con plants were 120 cm suckers

	INV	CON
Days from planting to flowering	152	146
Nº of leaves emerged during that period	31.2	22
Height at flowering (cm)	220	246
Length of the biggest leaf (cm)	182	199
Width of the biggest leaf (cm)	85	90
Number of hand per bunch	9	10.3
bunch length (cm)	77	86
Interval flowering - harvesting (days)	193	171
bunch weight (Kg)	22.7	27.6
Yield (ton/ha)	27	32.9
Bunch weight 2nd Cycle (kg)	35.3	35.5
Yield (ton/ha) 2nd Cycle	71.3	71.8

EFECTOS FITOTOXICOS EN EL BANANO CAUSADOS POR EL USO DE ACEITE AGRICOLA EN EL CONTROL DE SIGATOKA NEGRA

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INTRODUCCION

El uso de aceite agrícola o "citrolina" en las zonas bananeras de la República de México para el control de Chamusco ó Sigatoka Amarilla Mycosphaerella musicola se estableció a partir del año 1960. A partir de la presencia de la Sigatoka Negra en el año de 1981, el uso de este mineral se intensificó, considerando sus propiedades fungistáticas, acción preventiva, curativos cuando la Sigatoka atraviesa por el período de pisca, acción adhesiva y medio de penetración de otros productos químico - orgánicos. Tapachula, o zona de Soconusco en México tiene una época seca de 6 meses continuos y otro tanto de lluvias con una precipitación anual promedio de 1.800 m.m. para toda la zona y de 1.442.07 para la zona de Suchiate. (1).

Las temperaturas (1) no muestran mucha variación en los diferentes meses, siendo más altas en los meses de noviembre a abril que es una consecuencia de los días con más horas luz, humedades relativas entre 45-70% mayores índices de evaporación que es de 1667.62 m.m/año, etc., que tiene como consecuencia que la planta se deshidrate más aceleradamente y obligue a iniciar los riegos artificiales que para la zona de Soconusco se han establecido en cuatro sistemas: 1) el tradicional riego por gravedad o rodado, 2) riego por caño aspersor, 3) riego por microaspersión y, 4) riego por goteo, estos sistemas pueden ser eficientes en cualquiera de sus modalidades pero existen limitantes, sobre todo en la zona de Suchiate, del Suministro de agua, ya que ésta es proporcionada y coordinada por un organismo Oficial de la Secretaría de Agricultura y generalmente a veces no es oportuno el riego que se ha querido establecer en una lámina de 2.5 pulgadas cada 8 días. Además de los seis meses de riego mencionados, en época de canícula en los meses de julio-agosto, es necesario con 2 ó más riegos.

Las aplicaciones de aceite en cocteles de emulsión, en cualquiera de las épocas del cultivo causan alteraciones fisiológicas al usarlo continuamente y sobre todo en las épocas secas que aunado a los factores climatológicos mencionados anteriormente causan un stress en las plantas, manifestando exteriormente por una clorosis que puede llegar a quema total

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