

SHORT COMMUNICATION

'H-24-1' : A Tropical Tomato Breeding Line

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ABSTRACT :

Segregating generations of four parent crosses to develop processing and fresh market tomato for the arid tropics of northern Sudan, were handled by the pedigree method of selection. The parents were L. hirsutum f. glabratum, Texas TM-148, Campbell 52 and the breeding line 36-10. Segregants were evaluated for yield potential, processing and fresh market attributes. line 'H-24-1' at the F6 generation was marked as being suitable for processing, fresh market and particularly adapted for shipping due to its firm fruit. Field experiments for three consecutive seasons showed that 'H-24-1' consistently outyielded the commercially grown introductions in the arid tropics of northern Sudan viz. Strain B, Pearson, Early Pak No.7 and Money Maker.

INTRODUCTION

Tomato (Lycopersicon esculentum Mill) is an important vegetable crop in the Sudan. It is grown mainly as a winter crop during October - March.

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Tomato leafcurl virus (TLCV) has become limiting factor for successful cultivation all over the country (Yassin, 1984 and Geneif 1984 and 1986).

Currently, the main commercial cultivars grown in the country are the American introductions Strain B, Pearson, Early Pak No.7 and Money Maker. These cultivars developed originally for temperate regions and they perform poorly under tropical conditions of northern Sudan, giving erratic and low yields ranging 1-33 t/ha compared to 10-202 t/ha in temperate regions (Villareal 1979 and 1980).

A breeding program partly reported here was conducted at Hudeiba Research Station (17°34'N, 33°56'E, and 350 m. above sea level) to develop new genotypes for arid tropics of northern Sudan (16-22°N). Such genotypes were meant to be high temperature tolerant, resistant/tolerant to tomato leafcurl virus (TLCV) disease, high yielders with the desired processing and fresh market attributes and firm fruits that endure physical damage and long distance shipping.

ORIGIN

'H-24-1' originated from crosses made among four parents, Texas TM-148, Campbell 52, 36-10 and L. hirsutum (Fig. 1). The characteristics of these parents are :

Texas TM-148 : originally developed from Chico III, a high temperature tolerant cultivar that sets at 38°C, resistant to Fusarium wilt, has plum-shaped fruits and concentrated maturity. It is primarily a fresh market tomato.

Campbell 52 : a commercial cultivar of Campbell Soup Company, probably a selection for paste making of high soluble solids.

36-10 : a breeding line identified by (O. Pearson of Cornell University, U.S.A. - Personal communication, 1977) characterized by high number of firm-fleshed globular fruit per plant.

PI-18 (PI-134, 418) - Lycopersicon hirsutum f. glabratum : a wild relative of the cultivated tomato, known to be a source of resistance to some 16 pests of tomato, stress tolerance, pigmentation enhancement modifier genes (Rick, 1986 and Esquinas 1981) and resistance to tomato leafcurl virus (TLCV) disease transmitted by the whitefly Bemisia tabaci (Banerjee and Kalloo, 1987; Hassan et. al. 1982, 1984; and Mazyad et. al. 1982) which was our particular interest in it.

TM-148 x L. hirsutum

Campbell 52 x F1

36-10 x F1

F6(H-24-1)

Fig. 1 : Pedigree of 'H-24-1' tomato.

The pedigree selection method was performed in the segregated generations from F2 up to F6. By F6 plants within the same line were highly uniform and hence superior lines were marked for further

assessments (Mohamedali, 1986). The characters evaluated included potential yielding capacity on single plant basis as yield per plant, number of fruits and average fruit weight. Quality attributes included total soluble solids (TSS), pH, fruit characters particularly skin, texture, shoulders, shape, color, flesh flavor, interior and cracking as well as reaction to tomato leafcurl virus (TLCV) disease in particular.

During 1985/86-1987/88 field experiments were conducted to compare yield and quality of the genotype 'H-24-1' to the four commercially grown introductions; Strain B, Pearson, Early Pak No. 7 and Money Maker. Comparison was done in a randomized complete block design of four replications. The experimental plot consisted of three 120 cm beds, each of a planting length of 7 metres, planting at an in-row spacing of 35 cm. Nurseries were usually established during the third week of September and transplanted during the first week of November. Management practices were done in accordance with the recommendations of the research with the exception that no chemical spraying for insects or diseases control was practised.

DESCRIPTION AND PERFORMANCE

Vines of the genotype 'H-24-1', are upright large and vigorous with indeterminate growth habit. The leaves are of normal shape and large-sized. The dense foliage gives an adequate protection for the fruits against sun-scald. The genotype has a heavy fruit setting and concentrated maturity, as a main season genotype. The fruits of 'H-24-1' are large-sized having uniform red color, globe shape with the

blossom end tapering to a point. The fruit's skin is smooth with rounded shoulders. The flesh is firm, thick-walled. The interior of the fruit is meaty and having good flavor.

Laboratory analysis indicated that the fruits have a pH of 4.4 and TSS of 4.5%, that render the genotype suitable for processing, fresh market and particularly adapted for shipping due to its firm fruit.

Though the evaluation of 'H-24-1' reaction to TLCV disease, the most important single disease in Sudan indicated lower number of infected plants seasonally (Table 1), yet, that was not enough evidence of derived resistance from the wild resistant relative L. hirsutum, however, the dense vegetative growth, the large fruit size and high yield could be considered as parameters of tolerance. The line was rated as having low incidence of cracking and least affected by sunscalding due to its foliage cover. Neither infestation of the fruits by the American bollworm nor blossom end rot were observed to be a problem. The magnitude of high temperature tolerance is equivalent to that of Money Maker cultivar, the most tolerant among the commercially grown cultivars in the Sudan.

The genotype 'H-24-1' consistently outyielded the other cultivars in the three seasons. In 1985/86 and 1987/88 seasons yield differences between the new genotype 'H-24-1' and any of the tested cultivars were highly significant ($P=0.01$) and in 1986/87 were significant ($P=0.05$) between the new genotype 'H-24-1' and Strain B on one hand and 'H-24-1' and Money Maker (Table 1). Mean yield differences over the

Table 1. Mean marketable yield ($t\ ha^{-1}$), average fruit weight (g) and average percentage of plants with TLCV disease of the new genotype 'H-24-1' compared to the commercial cultivars during 1985/86 - 1987/88 seasons.

Cultivar or line	Seasons			Cultivar or line means
	1985/86	1986/87	1987/88	
	Marketable yield ($t\ ha^{-1}$)			
	($\pm 1.845^{**}$)	($\pm 2.757^*$)	($\pm 2.562^{**}$)	($\pm 3.766^{**}$)
H-24-1	15.072	26.627	26.951	22.883
Strain B	9.643	20.317	14.400	14.787
Pearson	8.938	22.396	17.579	16.304
Early Pak No.7	8.719	25.160	13.200	15.693
Money Maker	6.436	19.915	12.595	12.982
Season Means	9.762	22.883	16.945	16.530
	($\pm 6.570^*$)			
	Average fruit weight (g)			
	($\pm 12.2^*$)	($\pm 14.7^*$)	($\pm 4.0^{**}$)	($\pm 12.3^{**}$)
H-24-1	69	84	67	73
Strain B	46	58	55	53
Pearson	67	70	52	63
Early Pak No.7	60	76	58	65
Money Maker	42	47	35	41
Season Means	57	67	53	59
	($\pm 6.0^*$)			
	% plants with TLCV disease			
	($\pm 4.2^*$)	($\pm 6.5^{**}$)	($\pm 5.6^{**}$)	($\pm 3.8^*$)
H-24-1	83	32	89	68
Strain B	93	38	100	77
Pearson	86	45	90	74
Early Pak No.7	87	28	91	69
Money Maker	92	33	97	74
Season Means	88	35	93	72
	($\pm 35.6^{NS}$)			

NS, *, ** : Non-significant and significant at $P = 0.05$ and 0.01 respectively.

seasons of the genotype 'H-24-1' and Money Maker were highly significant ($P=0.01$) and only significant ($P=0.05$) between the genotype 'H-24-1' and Strain B.

Mean differences between 1986/87 and 1985/86 seasons were significant ($P = 0.05$)- Table 1. Calculated yield advantages of the genotype 'H-24-1' over the other cultivars indicated 134-56%, 34-6% and 114-53% in the three seasons 1985/86, 1986/87 and 1987/88 respectively. The yield advantage of the line is derived primarily from its large fruit size (Table 1).

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"H-24-1" : سلالة طماطم مدارية

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تمت عملية الانتخاب بطريقة التربية بالنسب في انعزالات الأجيال الناتجة من تهجين أربعة آباء من الطماطم لإستنباط سلالات تصلح للتصنيع والإستخدام الطازج في المناطق المدارية القاحلة في شمال السودان .

كانت الآباء المستخدمة هي الطماطم البرية *L.hirsutum* f *glabratum* والصنفان التجاريان Texas TM-148 و Campbeli 52 وسلالة التربية 10-36. قُيِّمَت الإنعزالات من حيث الإنتاجية وصفات التصنيع والإستخدام الطازج . أمكن في الجيل السادس إختبار السلالة "H-24-1" والتي تصلح للتصنيع والإستخدام الطازج إضافة إلى تميزها بخاصية تحمل ظروف النقل لصلابة ثمارها .

أوضحت التجارب على مدى ثلاثة مواسم متتالية تفوق وثبات السلالة "H-24-1" إنتاجياً على الأصناف التجارية المدخلة التي تزرع في شمال السودان وهي : إسترين بي ، بيريسون ، إيرلي باك ، ٧ ، ومني ميكر .

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