'Rotam 4', a Multiple Disease-resistant Fresh-market Tomato

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At the Vegetable and Ornamental Plant Research Institute near Pretoria a breeding program was initiated to develop multiple disease- and nematode-resistant cultivars. Major diseases of tomato (*Lycopersicon esculentum* Mill.) in South Africa for which resistance was sought are bacterial wilt caused by *Pseudomonas solanacearum* E.F. Sm., usually biovar 3 (race 1), fusarium wilt caused by *Fusarium oxysporum* f.sp. *lycopersici* (Sacc.) Snyder & Hansen races 1 and 2, verticillium wilt caused by *Verticillium dahliae* Kleb. race 1, and bacterial canker caused by *Clavibacter michiganensis* ssp. *michiganensis* (Smith) Davis et al. 'Rotam-4' is a fresh-market cultivar, resistant to the diseases noted and to *Meloidogyne incognita* (Kofoid & White) Chitwood and *M. javanica* (Treub) Chitwood. This new cultivar is also resistant to bacterial speck caused by *Pseudomonas syringae* pv. *tomato* (Okabe) Young, Dye & Wilkie.

Origin

'Rotam 4' originated from a cross made during 1980 (Fig. 1) between the breeding line L1051 and 'Flora-Dade'. L1051 was selected from a cross between the local cultivar 'Roodeplaat Albesto', from which nematode resistance was obtained, and line BW 4 introduced from North Carolina, from which bacterial-wilt resistance was obtained. L1051 is resistant to nematodes, bacterial canker, and bacterial wilt, but has a poor fruit quality, particularly with regard to firmness and internal color. 'Flora-Dade', the other parent, has good horticultural qualities and is resistant to fusarium wilt (races 1 and 2 of the pathogen) and to verticillium wilt (Volin and Bryan, 1975).

Tests for resistance

Resistance to bacterial wilt was tested by dipping the roots of 4-week-old test plants for 30 min in a suspension of the pathogen. The plants were grown in a glasshouse at 28 to 30°C. Ninety percent to one hundred percent of 'Rotam-4' plants did not wilt in typ-

ical tests with biovar 3 (race 1), whereas all the plants of susceptible lines wilted.

Resistance to bacterial canker was evaluated in glasshouse and field trials. Plants were inoculated according to the excised leaf method (Boelema, 1976). In a typical glasshouse experiment, 15% of the 'Rotam-4' plants showed symptoms of canker (one-sided wilting) 4 weeks after inoculation, whereas 48% of 'Roma VF' plants wilted. In a field trial, inoculation of 'Flora-Dade' resulted in a 93% reduction in yield of marketable fruit, and a 29% reduction in 'Rotam 4'.

Resistance to fusarium and verticillium wilt was evaluated in glasshouse trials. The roots of 4- to 5-week-old seedlings were dipped in a suspension of one of the pathogens. 'Rotam-4' was as resistant to these fungi as was 'Flora-Dade'.

Resistance to nematodes was tested in a glasshouse. About 5000 eggs of *M. incognita* and *M. javanica* per plant were added to 1-week-old seedlings of 'Rodade' (susceptible cultivar) and 'Rotam-4' plants kept at $\approx 24^\circ\text{C}$. Six weeks later, 'Rodade' plants were galled and females and eggs were found, whereas 'Rotam-4' plants did not show any galls and were free from the nematode.

Resistance to bacterial speck was tested by inoculating 6-week-old plants with two bacterial strains and evaluating the plants for symptoms for 7 to 14 days after inoculation. 'Flora-Dade' plants, used as the susceptible standard, showed typical bacterial speck symptoms, whereas 'Rotam-4' showed only slight browning of the edges of a few of the lower leaves.

Description

'Rotam-4' has a determinate growth habit, attaining a trellised height of 1.3 m, which is slightly taller than that attained by 'Flora-Dade'. The leaves are dark green and of a normal shape.

The fruit quality of 'Rotam 4', in our judgment, is excellent, especially with regard to firmness. The fruit is resistant to cat-face and cracks, is round to oblate, slightly green-shouldered, and attains an average mass of 120 g. The fruit pedicels are jointed, but when harvested the pedicel usually remains fixed to the plant.

During 1987-88, 'Rotam 4' was com-

Table 1. Average yield ($\text{t}\cdot\text{ha}^{-1}$) of marketable fruit of 'Rotam 4' and other fresh-market tomato cultivars grown at three localities in the Republic of South Africa during 1987-88.

Cultivars/breeding lines	Fruit diam (mm)	
	50-70	> 70
	<i>Average yield ($\text{t}\cdot\text{ha}^{-1}$)^a</i>	
Rodade	83.5	26.9
Rotam 4	50.8	38.1
Stevens	68.2	19.7
Rotam 3	63.8	14.0
Flora-Dade	57.3	14.5
Champagne	34.7	16.3
LSD _(T) ($P = 0.05$)	11.6	13.6

^aValues represent means of four replicates at each locality.

Fig. 1. Pedigree of the tomato cultivar 'Rotam 4'.

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pared to other cultivars grown at Pretoria, Bloemfontein, and Port Elizabeth, South Africa. In these trials, the bacterial wilt-resistant cultivar 'Rodade' outyielded 'Rotam 4' significantly in the 50- to 70-mm range (Table 1). The yield of 'Rotam 4' did not differ significantly from that of 'Flora-Dade' in the 50- to 70-mm range but was greater than that of 'Flora-Dade' in the > 70-mm range. The plants in these field trials were relatively free

from the diseases and pests to which 'Rotam 4' is resistant.

Availability

'Rotam 4' is protected by Plant Breeders Rights. Requests for seed for breeding purposes may be directed to The Director, Vegetable and Ornamental Plant Research Institute, Private Bag X293, Pretoria, 0001, Republic of South Africa.

Literature Cited

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