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ABSTRACT

Rhizomania, caused by beet necrotic yellow vein virus (BNYVV), is a major disease of sugarbeets world-wide. The ‘Holly’ resistance gene (*Rz1*) confers strong resistance to several BNYVV isolates and has been incorporated into most major sugarbeet breeding lines. However, the threat presented by resistance-breaking isolates of BNYVV, to which the Holly gene does not confer adequate resistance, underscores the need for novel sources of Rhizomania-resistant germplasm. The Tandem® sugarbeet variety combines resistances to BNYVV from two sources: the *Rz1* (Holly) gene and a proprietary *Beta maritima*-derived source.

Beets from Tandem®, Holly-mediated resistant, and susceptible non-*Rz* lines were harvested during the growing season (4, 6, 9 and 15 weeks after planting) and at harvest (21 weeks after planting) from replicated microplots with heavy Rhizomania disease pressure in the Red River Valley (North Dakota). Multiple root samples were analyzed for virus accumulation with a quantitative TAS-ELISA protocol. At harvest beets were collected and analysed for root yield, sugar content and juice purity parameters.

BNYVV titers were significantly (ANOVA test; $p > 0.05$) and uniformly lower in samples from Tandem® or ‘Holly’ than those from the susceptible control from week 15 after planting on. Analysis of juice purity show that the resistant commercial SESVanderHave lines Tandem® and ‘Holly’ have better values than the susceptible line, which indicates that these beets can be grown on infested soil without changes of juice purity.

In this field trial the revenue (\$/acre) is significantly different (ANOVA test; $p < 0.05$) between the susceptible line and the two resistant lines Tandem® and ‘Holly’. A similar trend is observed for all other root and sugar parameters. Between the two resistant lines, no significant differences could be observed but the raw data show a clear advantage of Tandem® to ‘Holly’ sugar beets grown on BNYVV-infested soil.

The results obtained during this field trial in the Red River Valley clearly indicate that a strong resistance to BNYVV isolates is desirable to obtain adequate revenue. Both resistant lines, ‘Holly’ and Tandem® comply with this requirement, although both sources have clearly different resistance mechanisms. The combined resistance, present in the Tandem® rhizomania varieties, performs very well in highly infested soils contaminated with rhizomania resistance breaking isolates, as in the centre of Spain, in California and in the Southern Minnesota region, as shown in this experiment. This study confirms previous studies made in Europe¹.

¹ Meulemans, M., Horemans, S. and Janssens, L. (2003) Interaction between different major genes and influence of the genetic background in the expression of rhizomania resistance. 1st joint IIRB – ASSBT Congress, 27 feb. – 1 march 2003, San Antonio, Texas (USA), pp 161-174.