Influence of the growing system on agronomic parameters of “wild” and cocktail tomatoes from organic outdoor production

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Introduction

With a world production of 159 million tons of fresh fruits in 2011 (FAOSTAT) tomato is the most cultivated vegetable. Tomato production is limited by late blight caused by *Phytophthora infestans* (Foolad et al. 2008). In organic agriculture the use of genotypes showing high resistance is a promising tool against this disease. According to Horneburg and Becker (2011), selected small fruited “wild” tomato genotypes show a higher field resistance against *P. infestans* than genotypes with larger fruits. However, due to their small fruits when grown as staked tomatoes these genotypes reach only low yields (Horneburg and Watschong 2005). The current study had the goal to investigate the agronomic performance of “wild” and cocktail tomato genotypes in different growing systems.

Materials and Methods

Two “wild” tomato and two cocktail tomato genotypes selected in the Organic Outdoor Tomato Project (Horneburg & Becker, 2011) were cultivated in organic outdoor trials (***Fig. 1***). In 2009 three growing systems were compared: Plants pruned to i) one shoot ii) three shoots and iii) unpruned plants in the Göttinger System. In 2010 only i) and iii) were studied. Distance between rows 2.5 m, distance between plants 0.5 m in i) and ii), 1 m in iii). Fruit weight, number of fruits, yield per plant and the infection of leaves and fruits with *P. infestans* were determined.

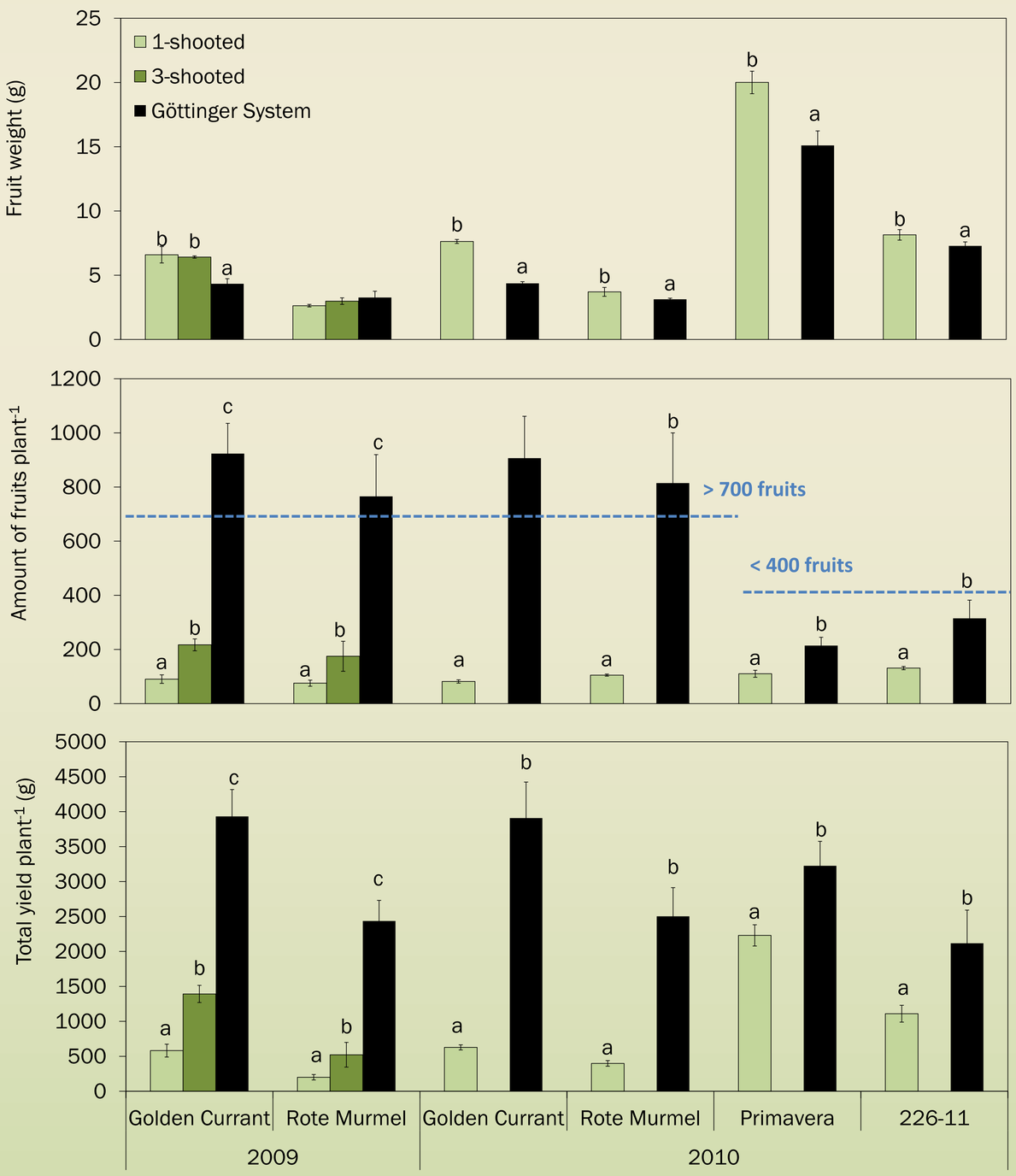

Fig. 2 Fruit weight, number of fruits and total yield per plant. Data represent means and standard deviations (n = 3). Different letters indicate significant variation between growing systems within each genotype and year (ANOVA and tukey-test; $\alpha \leq 0.05$).

Results and Discussion

▪While the fruit weight of the tested tomato genotypes was generally reduced in the Göttinger System, yield increased due to a much higher number of fruits (***Fig. 2***).

▪This effect was especially pronounced for the small fruited “wild“ tomatoes. In both years more than 700 fruits per plant were produced while the cocktail tomatoes never yielded more than 400 fruits (***Fig. 2***). Marim et al. (2005) observed higher fruit numbers of reduced size even if plants with two shoots were compared with plants that were pruned to one shoot.

▪The reduced fruit weight in the Göttinger System was obvious mainly for cvs. Golden Currant and Primavera (***Fig. 1***). It may be explained by competition for assimilates (Ferridano 2010).

Fig. 1 “Wild” tomato genotypes (Rote Murmel, Golden Currant) and two cocktail tomato genotypes (Primavera, 226-11). Left: One-shooted system. Right: Göttinger System.

▪The end of the harvest period (22.7.-30.9.2009; 4.8. - 29.9.2010) was accompanied by an increased infection with *P. infestans* (***Tab. 1***) and overall reductions in yields.

▪Increased infection of leaves and fruits with *P. infestans* in the Göttinger System was observed in 2009. In 2010 the effect was not as pronounced as in 2009. Plants with a dense canopy dry off slower, thus favouring fungal infections (Ferridano 2010).

▪Genotypic differences could be observed: Primavera had the lowest level of resistance against *P. infestans* (***Tab. 1***).

Tab. 1 Infection of leaves and fruits with *P. infestans* as influenced by the growing system. Data represent the infection severity (means ± standard deviation, n=3; 1=no infection, 9=highest infection level) estimated in two years with two specific dates of two (2009) and four (2010) genotypes. Within each genotype the multishooted and 3-shooted growing systems were compared with the 1-shooted system by the use of U-Test (ns not significant; *significant at $p \leq 0.05$).

		Infestation of leaves		Infestation of fruits	
Genotype	Growing system	23.9.2009	6.10.2009	23.9.2009	6.10.2009
Golden Currant	1-shooted	4.4 ± 0.3	8.1 ± 0.4	2.2 ± 0.2	2.7 ± 1.6
	3-shooted	4.8 ± 0.2ns	8.5 ± 0.4ns	2 ± 0ns	5.5 ± 4.0ns
	Göttinger System	7.8 ± 0.2*	9 ± 0*	3.6 ± 0.5*	9 ± 0*
Rote Murmel	1-shooted	4.2 ± 0.2	6.5 ± 0.5	1.8 ± 0.2	1.4 ± 0
	3-shooted	4.6 ± 0.1*	6.3 ± 1.005ns	2 ± 0ns	2.1 ± 1.1ns
	Göttinger System	6.1 ± 0.5*	7.5 ± 0.2ns	2.2 ± 0.4*	2.7 ± 1.2*
		8.9.2010	30.9.2010	8.9.2010	30.9.2010
Golden Currant	1-shooted	3.7 ± 0.3	6.7 ± 0.6	2.03 ± 0.6	3.4 ± 0.5
	Göttinger System	3.3 ± 0.6ns	7 ± 0ns	2.8 ± 1.3ns	3.7 ± 0.6ns
Rote Murmel	1-shooted	2.3 ± 0.4	4.7 ± 0.5	1.5 ± 0.4	3 ± 1.1
	Göttinger System	3.6 ± 1*	5.7 ± 0.5*	2.6 ± 1*	2.8 ± 0.4ns
Primavera	1-shooted	4 ± 0	7 ± 0	2.8 ± 0.3	5.8 ± 0.9
	Göttinger System	4.2 ± 1.1ns	7.5 ± 0.7ns	3.6 ± 2.1ns	6.7 ± 1.2ns
226-11	1-shooted	3.3 ± 0.1	6 ± 0	1.1 ± 0.1	1.8 ± 0.3
	Göttinger System	3.4 ± 0.4ns	5.5 ± 0.3ns	1.4 ± 0.5*	2.6 ± 0.5ns

Conclusion

Growing tomato plants in the Göttinger system tends to increase the infection with *P. infestans*. Nevertheless, little or no pruning of small fruited “wild“ and cocktail tomato genotypes is a promising tool to enhance fruit yield and reduce labour input in pruning.

References

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