Differential reactions of bush bean cultivars towards common and fuscous blight (Xanthomonas campestris pv. phaseoli and X.c. pv. phaseoli var. fuscans)

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The resistance of different bean cultivars, accessions and species (Phaseolus vulgaris, P. aborigineus, P. acutifolius, P. coccineus and P. lunatus) against common blight (Xanthomonas campestris pv. phaseoli) and fuscous blight (X.c. pv. phaseoli var. fuscans) was tested in the greenhouse. In total 136 different bean lines were included which were obtained from different institutions and reported to possess disease resistance.

A reproducible determination of degree of resistance was only possible under very accurate inoculation conditions and evaluation criteria. Only the first trifoliates were inoculated by evenly infiltrating the whole leaf area from the abaxial surface by a glass atomizer under pressure. A concentration of $1 \times 10^4$ CFU/cm$^3$ proved to be best suited (day and night temperature in the greenhouse: $32 - 20 ^\circ$C). Under these conditions the bean line XAN 112 showed a resistant reaction, whereas higher bacterial concentrations caused a partial susceptible reaction. The disease reaction was evaluated at 22 to 26 days after inoculation. In this period the bean leaves revealed maximum disease symptoms before signs of senescence and natural leaf fall appeared. The reaction was scored according to percent diseased leaf area.

Resistance in several bean lines could be traced back to the following sources: PI 319443 (P. acutifolius), P. aborigineus, P. coccineus, P. lunatus, PI 207262, GN Neb.no.1 Sel.27, STIP, VAILLANT and K 816. Some genetic sources of resistance occurred in several tested resistant bean lines. However, in a few resistant bean lines the resistance could not be traced back to known sources.

In several cases, marked differences were recorded in degree of resistance towards the incitants of common and fuscous blight. Thus, 72 bean lines reacted resistant against Xpf but not against Xp. Vice versa 12 bean lines with resistance towards Xp and
susceptibility towards Xpf were detected. Only 22 bean lines, including the species *P. aborigineus*, *P. acutifolius*, *P. coccineus* and *P. lunatus*, showed resistance against both bacterial pathogens.

The specific reactions against *Xp* or *Xpf* indicate the existence of different virulence mechanisms in the bacteria.

The differential reaction of bean lines against *Xp* and *Xpf* could be confirmed by determination of bacterial multiplication "in planta". For these investigations six bean lines (89/110-7, Wis. BBSR 130, BAC 6, GN Neb.no.1 Sel.27, 84-501-1 and XAN 159) were selected which reacted resistant against either one or both of the pathogens. During the exponential growth phase a generation (doubling) time of 7.4 hr. was determined "in planta". Within the first 3-4 days after inoculation the bacterial growth rate in susceptible and resistant leaves was nearly identical. After the sixth day bacteria no longer multiplied in resistant leaves and reached a population of 5x10^4-5x10^5 CFU per cm^2 leaf. In susceptible leaves bacterial growth continued until 10-15 dpi (10^7-10^8 CFU/cm^2 leaf). Within this period the water-soaked spots reached maximum size as well. In one combination (*Xpf* in bean line 84-501-1) a high bacterial multiplication without typical disease symptoms was recorded indicating a tolerant reaction.

It was concluded from these studies that successful breeding against bacterial blight in beans should include both pathogens, *X. phaseoli* and *X.p. var. fuscans*, since it cannot be excluded that different virulence mechanisms play a role in these two pathogens.