BIOFUMIGATION AND GRAFTING IN PEPPER AS ALTERNATIVE TO METHYL BROMIDE

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World consumption of Methyl bromide (MB) in pepper crops has been estimated at 6,476 t, with the USA as the main consumer (2,041 t), where pepper holds 3rd place (15 %) after tomato (35%) and strawberry (18%). In the rest of the world pepper crops hold 4th place (8%), after tomato (35%),strawberry (20%) and cucurbits (95). Spain is the 2nd greatest MB consumer for this crop (1,206 t in 1997), mainly in the Southeast (Murcia and Alicante), where pepper holds 2nd place (29%) after strawberry (33%) (Bello *et al.* 1997). Chemical and non-chemical alternatives to MB exist, though they are normally associated with tomato crops (MBTOC 1998). Among non-chemical alternatives, biofumigation has been applied successfully in Spain (Bello *et al.* 2000, Lacasa *et al*., 2000).

Materials and Methods

Biofumigation experiments have been carried out in Murcia (Spain), in a greenhouse affected by a population of *Meloidogyne incognita*, race 1. The fumigant effect of sheep manure plus 25% chicken manure was analyzed after one, two and three years of treatment. Doses were decreased every year from the initial dose of 100 t ha^{-1}, to 75 t ha^{-1} the 2nd year and to 60 t ha^{-1} the 3rd year. Results were compared to a MB (98:2) treatment at a dose of 30 g m^{-2} and to the control plots. Three repetitions of each treatment were studied. Biofumigation plus solarization was applied during August 2000 and cv. Ribera peppers (De Ruiter seeds) were transplanted in December. Nematode populations were extracted from 100 g of soil by centrifugation in February. At the end of the crop, in August 2001, the root-knot index of *M.incognita* was evaluated in 24 plants per treatment. Simultaneously, grafting techniques using rootstocks resistant to *M. incognita* and *Phytophthora capsici* were developed, to prevent the risk of infection by these pathogens, which usually affect pepper negatively towards the end of cropping due to its length (10 months), in spite of chemical treatments or biofumigation.

Results

According to February's nematode soil analyses, biofumigation is as effective in controlling *M.incognita* as MB, and saprophagous nematodes increased after biofumigation, while nematofaune biodiversity in the MB treatments was null. The average indexes of *M.incognita* root nodulation at the end of the crop in the month of August are as follows, according to treatments: 3rd year of biofumigation (1.6), 2nd year (1.9), 1st year (4.5), MB treatment (1.2) and control group (6.8). All treatments show higher indices near the edges of the greenhouse. According to root nodulation development, *M.incognita* infestation in the treated plots is considered to start after June.

Grafting experiments began by identifying the *Meloidogyne* populations in Murcia's pepper crops. In most cases they belonged to the *M.incognita* race 1 that does not parasitize pepper cultivars with the *N* gene, which are resistant to *M.incognita*. Occasionally, race 3 populations appeared such as Carolina Wonder and Charleston Belle, which do affect resistant cultivars (Fery and Dukes, 1996).

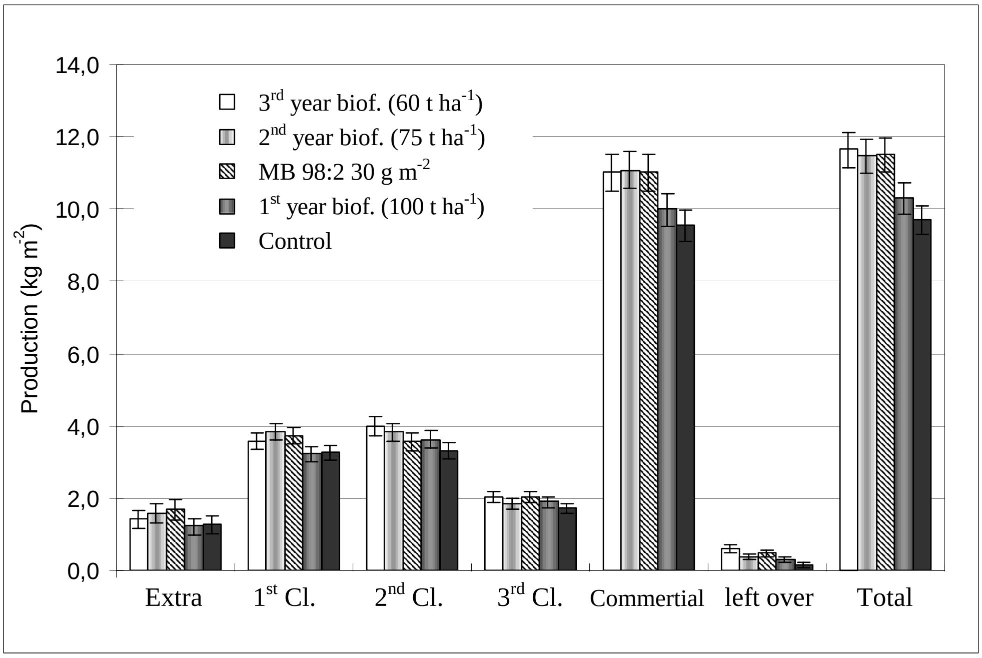

Figure 1. Average production by quality in the 2000-01 season. LSD Intervals to 95% with Log $_{10}$(x+1) transformed data.

Conclusions

- Biofumigation has a similar efficacy as MB in *M.incognita* control. There are no significant differences between biofumigation from the 2nd (11.5 kg m^{-2}) and 3rd (11.7 kg m^{-2}) years and MB (11.5 kg m^{-2}) treatments in pepper production (Fig.1).

- The use of grafting in long cycle crops, such as pepper, is of great interest, because important fungi and nematode infections can appear in the final months of cultivation. The grafted plants can maintain in time the efficacy of biofumigation and chemical treatments.

References

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