

Optimization of technology for the growing of roses in unheated foil tunnels using the method of stems bending

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An alternative to increasing competition and to lowering the cost of production of cutting roses flowers is growing them in unheated foil tunnels and conducted with the new methods of shrub formation. These methods ensure numerous foliage of shrubs and suitable cutting of flowers does not limit the assimilative mass. The method of rose crop with bending of shoots is used in the whole-year greenhouse cultivation but it is also possible to adapt it in unheated foil tunnels. Variable thermal conditions in the foil tunnel can lead to lowering the health of the bushes and as also to the quality of the flower yield. It requires systematic protection of plants, and in the interests of human health and the environment, also the reduction of applying of chemical plant protection products for that purpose, towards biological preparations.

The aim of the studies was the assessment of impact of new shrub formation methods and various rootstocks on the yield and quality of roses cultivated in a foil tunnel without heating. The researches were undertaken to verify in which phase of flower bud development and in which number it is the best to bend the shoots to the maximum increase of the assimilation area of the bush. It was investigated how the bending of the shoots affects the photosynthetic activity of the leaves, depending on their age and location in the bush. The analyses were undertaken on the efficacy of biopreparations in keeping the bushes in good condition and their influence on the parameters of gas exchange.

Studies have shown that the use of method of shrubs forming by bending parts of spring shoots provides the good yielding of roses, and the parameters of cut flower shoots obtained from shrubs are similar to each other both from traditionally carried out and adapted methods. Removal of the flower bud along with the leaf on the bending shoots accelerates the momentum of stem sprouting from latent buds. The bending of the three stems in the budding stage of the colour showing bud, combined with the removal of the flower bud and the leaf underneath it, turned out to be the most beneficial. Grown that way bushes are characterised by the high yield and their high yield parameters, including the long shoots, which are similar to those obtained from the other combinations. The bushes budded on multiflora rose and cropped in the unheated foil tunnel were characterized by higher yield in comparison to bushes grafted on wild rose 'Schmid's Ideal'.

Flower shoots obtained from bushes carried out by adapted and traditional methods are characterized with comparable number of leaves. The budded bushes on multiflora rose rootstock also exhibited more abundant foliage than that planted on wild rose 'Schmid's Ideal', and the increased number of shoots did not adversely affected the parameters of leaf blades. Larger area and diameter were characterized by leaves of bushes grown on two-year-old multiflora rose than on one-year-old rootstock and on wild rose 'Schmid's Ideal'.

The rate of infestation of bent and floral shoots was comparable at the beginning of the growing season, and its highest values were recorded in the autumn. Plants sprayed with 1% Biosept 33 SL showed a similar degree of infection of leaf blades as chemically protected control combinations. A low degree of infestation of plants sprayed with Biosept 33 SL and a small number of pathogenic fungi obtained from isolation at a similar level as in chemical protection and a significantly smaller number of isolated fungi than plants protected with Biochikol 020 PC, testify to the high suitability of this biopreparation for protecting roses in foil tunnels.

It was claimed that the date of measurements of photosynthetic activity of rose bushes had a significant impact on photosynthesis (P_n), transpiration (E), stomatal conductance (G_s) and intercellular CO_2 concentration (C_i). Their highest values were recorded during the peak of the growing season, then these parameters systematically decreased reaching the lowest values at the end of the growing season. Floral shoots showed significantly higher parameters of gas exchange in relation to bent shoots. The value of the water use coefficient (WUE) and the instantaneous water use coefficient ($WUEI$) depends on the age of the shoots. The older bent shoots were generally characterized by lower WUE and $WUEI$ indicators than flower shoots.

The introduction of rose crop in unheated foil tunnels using the adapted method with bent stems to the horticulture production, can give measurable benefits in the form of a significantly increased yield. In combination with biological protection, it can affect the reduction of chemicals, in line with the new concept of gardening development in an integrated and ecological system.