AGRONOMY OF RASPBERRY (*Rubus idaeus* L.) CULTIVATION: KEY AGRONOMIC FACTORS ENSURING STABLE YIELD

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Abstract. This thesis systematizes, based on an analysis of scientific sources, the key agronomic factors that ensure stable yield and high fruit quality in raspberry (Rubus idaeus L.) plantations. In particular, it briefly addresses site selection and agroecological soil assessment (soil fertility, pH, and water-holding capacity), plant nutrition and water supply (fertilizer application rates and irrigation scheduling), plantation management technologies (support/trellis systems, pruning, and training), as well as the effects of integrated pest and disease management (IPM) approaches on plantation performance. Practical recommendations aimed at improving resource-use efficiency and enhancing phytosanitary sustainability are summarized. It is emphasized that raspberry yield and fruit quality largely depend on site conditions, planting technologies, and irrigation regimes. The factors discussed are crucial for ensuring fruit quality, productivity, and environmental sustainability.

Keywords: raspberry, plantation, soil analysis, pH, fertilization, drip irrigation, trellis, IPM.

Field and Soil Requirements

For the sustainable management of raspberry plantations, sufficient soil depth for root development and adequate water-holding capacity are regarded as critical factors. The source indicates that shallow soils generally have poor water retention, which limits proper root system development and,

consequently, reduces overall plant growth and yield. Therefore, a minimum rooting depth of 18 inches (approximately 45 cm) is recommended for raspberry cultivation. Prior to plantation establishment, soil analysis is considered an essential step, including the evaluation of soil pH, macro- and micronutrient status, organic matter content, and cation exchange capacity. For most raspberry cultivars, a soil pH of 6.0–6.5 is regarded as optimal. In terms of irrigation technology, drip irrigation is generally considered preferable to overhead sprinkler irrigation. It is also specifically noted that adjusting soil pH, either by increasing it with lime or lowering it with sulfur, typically requires approximately one year. [1]

Plant Nutrition and Fertilization

The source interprets fertilization not as an isolated practice, but as an integral component of the overall plantation management system. It is emphasized that the targeted application of nutrients has a direct influence on yield, fruit quality, ripening time, and the general vigor of plant growth. At the same time, the effectiveness of fertilization is closely linked with other agronomic factors, and deficiencies in irrigation or pest and disease management cannot be compensated for simply through fertilizer application. Similarly, low soil pH and poor drainage are identified as major limiting factors for achieving high yields. Regarding nitrogen recommendations, summer-bearing red raspberries require 30–50 lb N/acre during the establishment year and 50–80 lb N/acre in subsequent years. For primocane (fall-bearing) cultivars, an additional 20 lb N/acre at the flowering stage is recommended. [2]

Trellising Systems in Commercial Production

Under commercial production conditions, the source clearly states that summer-bearing red raspberries are rarely managed without a trellis system, meaning that structural support is essential for maintaining cane stability. The simplest trellis design consists of a single wire positioned 5–6 feet above ground level. However, it is also noted that multi-wire trellis systems are

commonly used in practice depending on plantation density and cane load. Such support systems reduce cane lodging, help maintain row structure, and facilitate cultural operations as well as harvesting. Although primocane cultivars may, under certain con

Training and Pruning Practices

The source stresses that careful selection of training and pruning methods is essential, as these practices are among the most labor-intensive and economically demanding operations in raspberry production. It is further noted that different species and production types, including primocane and summer-bearing forms, require different trellising and pruning approaches. In particular, primocane red raspberry canes are described as top-heavy, meaning that the upper portion of the cane becomes heavier and therefore requires support to ensure efficient harvesting and convenient movement within the rows. Practical examples mentioned in the source include temporary T-trellis systems and twine support methods applied from both sides of the row. [4]

Integrated Pest and Disease Management (IPM)

In the management of *Phyllocoptes gracilis* (raspberry leaf and bud mite), the source presents field trials conducted within the framework of integrated pest management (IPM), in which several products with different modes of action and their application rates are reported. Specifically, in addition to chemical acaricides, several alternative or supplementary options are also included within the IPM strategy, such as abamectin at 1.0 $L \cdot ha^{-1}$, acequinocyl at 1.0 $L \cdot ha^{-1}$, fenpyroximate at 1.5 $L \cdot ha^{-1}$, spirodiclofen at 0.4 $L \cdot ha^{-1}$, orange oil at 0.1%, and silicone polymers at 0.2%. These findings demonstrate that IPM should not rely on a single product, but rather on the flexible use of different control measures adapted to field conditions. The study also notes that the effects of mite control treatments on certain leaf metabolites were evaluated. The authors emphasize that the positive results obtained with orange oil support

its inclusion in IPM strategies, including those applied in organic raspberry production systems. [5]

Conclusion

According to the reviewed sources, high and stable raspberry yields can only be achieved through an integrated agronomic management approach. Site selection, soil agroecological assessment, pH and moisture regulation, analysis-based fertilization, trellising, pruning, training, and IPM should be managed as interconnected components of a single system. Weakness in one factor can reduce the effectiveness of the others, while their combined application improves yield stability, fruit quality, and ecological sustainability. In particular, adequate rooting depth, proper soil pH, balanced fertilization, systematic canopy management, and need-based pest control are essential for maintaining productive and sustainable raspberry plantations.

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