FEATURES OF WATER RELATIONS IN FRUIT TREES DEPENDING ON GROWING CONDITIONS AND GENOTYPE

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Background: Water stress is one of the most damaging abiotic stressors affecting agricultural crops. The physiological study of plant responses during periods of declining soil and air moisture made it possible not only to determine the influence of dehydration on tree condition, but also to assess their drought resistance.
The aim of this study was to evaluate the influence of growing conditions and genotype on water exchange and drought tolerance of plum and apple trees throughout the annual vegetation cycle.
Materials and methods: Two fruit tree species were included in the study: pome fruits represented by the apple varieties *Granny Smith* and *Golden Spur*, and stone fruits represented by the plum varieties *Udlinionnaya* and *Stanley*. The research was conducted under laboratory and field conditions and included the assessment of physiological indicators related to the water regime, namely total water content, relative leaf turgidity, water deficit, water-holding capacity, and leaf transpiration rate.
Results: During the dry period of the growing season (July–August), more pronounced changes occurred in the water regime than during the more humid months (May–June). Studies showed that the quantitative losses of total water content in the leaves of both apple varieties during the growing season were greater than those in plum varieties. The decrease in water content led to reduced transpiration intensity and an increased ability of the leaves to retain water. Maximum transpiration was observed in spring, followed by a continuous decline until autumn. The transpiration intensity of apple leaves, which had a larger foliar surface and a thinner cuticle, exceeded that of plum leaves. In trees grown under conditions of insufficient humidity, transpiration was less intense, whereas the water-holding capacity of the leaves was more pronounced. On hot and dry summer days, strong transpiration combined with reduced water uptake caused water deficiency in the leaves, which correlated with the degree of plant water supply. Lower water deficiency was recorded in the leaves of plum trees grown under both optimal and insufficient humidity conditions. Drought-resistant fruit trees were characterized by higher tissue water content and lower water deficit, resulting in relatively high turgor. The relative leaf turgidity of trees grown under optimal conditions showed higher values than that of trees grown under insufficient humidity, especially during July–August. Plum trees exhibited greater leaf turgidity than apple trees.
The study demonstrated that plum varieties, during the growing season, were characterized by higher tissue water content, greater transpiration intensity, lower water deficit, higher water-holding capacity, and a smaller decline in leaf turgidity compared with apple varieties. Growth of both apple and plum trees under insufficient humidity reduced the efficiency of physiological processes compared with trees grown under optimal humidity, as reflected in the studied indicators.
Conclusions: Plum varieties are characterized by moderate drought resistance, whereas apple trees exhibit low drought resistance in both species. As a result of the study, we concluded that plum trees are characterized by moderate drought resistance, whereas apple trees exhibit low drought resistance.
Keywords: fruit crops, water regime, optimal humidity, drought resistance, water deficiency.