

STUDY OF WINE-GROWING LAND (“TERROIR”) CHARACTERISTICS IN THE CANTON OF VAUD (SWITZERLAND): ECOPHYSIOLOGICAL BEHAVIOUR OF THE VINE (CV. CHASSELAS)

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A study of the physiological and agronomical behaviour of the vine (cv. Chasselas) was conducted between 2001 and 2003 by the Swiss Federal Research Station for Plant Production at Changins (Agroscope RAC Changins) on various wine-growing farms (terroirs) in the Canton of Vaud (Switzerland), as part of a study project on Vaudois vines and vineyards in association with the firm I. Letessier (SIGALES) in Grenoble and the Federal Polytechnic School of Lausanne (EPFL).

In order to identify the typical characteristics of Vaudois wine-growing plots or “terroirs”, the chosen working method attempted to integrate all factors susceptible of influencing “terroir” functions : on the one hand, natural parameters (geology, soil and climate), and, on the other hand, vine response, the most important indicator of ‘terroir’ value.

The study of vine behaviour was carried out over a region comprising about fifty Chasselas plots spread out over four pilot zones (1000 ha approximately). The defined pedological units, which are representative of vineyards, led to pertinent plant responses, in particular concerning hydrous plant reactions in the vine, its vegetative outgrowth, in addition to qualitative characteristics of the harvest.

Conditions of water supply to the vine were closely linked to soil water reserves (useful reserve, RU) and to summer rainfall during the 2001-2003 growing seasons. The study of water supplies to the vine, measured by means of Ψ_{base} , showed that the level of water stress was low in 2001. The 2002 season differed by its moderate water stress during the period of grape development on sites with low RU (sloping and compact moraines, sandy-stony soils, moraines covering conglomerates and sandstones, or limestone). In all other places, water supplies to the vine were not restricted. In 2003, water stress levels rose during the growing season as a result of a severe water deficit during the summer and heatwave temperatures recorded in June and August. Whatever the type of soil or site, water potential values continued to fall without exception from the time of flowering up until mid-August. The wine-growing region, as a whole, suffered from moderate water stress levels during grape development. In some vines (sloping and compact moraines or sandy-stony soils with low RU), high water stress levels were observed with natural leaf loss in the grape-bunch zone.

Results from measurements of minimum stem water potential ($\Psi_{T \text{ MIN}}$) have also demonstrated that temporary water stress on a daily basis is possible: thus, Ψ_{TIGE} proves to be reliable indicator for studying the emergence of water deficits or persisting stress after rainfall in wine-growing “terroirs”. Our observations indicate that there is a close correlation between the carbon isotope discrimination technique ($\Delta C13$) in grape sugars and the water supply observed in grape-vines during ripening (sugar accumulation phase in berries).

Early flowering and fruiting in “terroirs” and the speed of plant growth were mainly influenced by the thermic mesoclimate (altitude, angle and orientation of vineyard slopes). Encouraging results were obtained from the identification of distinct plant-growth stages (e.g. burst of budburst) and climatic units. Plant outgrowth of vines, as an expression of leaf biomass together with mass of pruned wood, were largely dependant on soil water reservoirs and conditions of plant water stress during the

growing season. Trained vines on high RU land gave both greater pruning masses and greater individual vine-branch masses than vines established on restricted RU soils with limited root systems.

The water supply system to plants, which was observed during grape development, had an important influence on the final berry size and the accumulation of their reduced sugars. Higher levels of sugar in berries were obtained from vines which had suffered from moderate water stress than from vines characterised by the absence of any water stress. The beneficial role of moderate water stress during grape development is thus proven for sugar accumulation and for early stunting of plant growth (around the time of ripening). However, situations of increased water restriction (high stress) penalised reduced must concentration. This was even more noticeable in the case of early water stress.

Finally, in order to rationalise the relationship “vine water supply system – plant outgrowth – berry parameters”, it is necessary to take into consideration a given situation of water stress, the time of its appearance, its duration and intensity. The ability to regulate the water supply system in a “terroir” appears to be its most important qualitative parameter.