Double cropping of potatoes in a semi-arid environment: the association of ground cover with tuber yields*

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Summary

The association of ground cover and ground cover duration with fresh- and dry-weight potato tuber yields in a semi-arid Mediterranean climate, was investigated. Cultivars of different maturity classes were tested under the contrasting climatological conditions of the spring and autumn seasons. The correlation coefficients of ground cover (GC) and ground cover duration (GCD) with fresh- and dry-weight tuber yields were lower for the autumn than for the spring season. In both seasons, high yields were positively correlated with high GCD. However, variation in tuber yields was evident in cultivars with similar GCD, indicating the involvement of factors other than ground cover and light interception in tuber yield.

Introduction

In many subtropical countries potatoes can be grown twice a year (double cropping) (Slomnicki, 1961; Susnoschi, 1981a). In some parts of the Mediterranean region potatoes are grown in the spring season, with planting during late January or February and harvesting during May, June and July. Some of the tubers harvested in May and June are kept as seed for the subsequent autumn season (planted in late August or early September and harvested during December and January).

Growers in these regions prefer cultivars that are able to produce high tuber yields of good quality potatoes in both seasons. This requires cultivars that can adapt to contrasting climatological conditions: in the spring season, growth starts when temperatures are relatively low and daylength relatively short, and growth continues under increasing temperatures, daylength and irradiation; in the autumn season,
growth starts when temperatures are high and the daylength is relatively long, and growth continues under decreasing temperatures, daylength and irradiation (Fig. 1).

Another character required for successful growth in the autumn season is a short tuber rest period, i.e. the duration of obligatory dormancy (Emilson, 1949) should be short. Because seed tubers for the autumn season are harvested at the end of May or the beginning of June, their rest period should not exceed ca. 60 days if good emergence and uniform plant growth are to be achieved after planting in late August. Often, because seed tubers produced in the spring and planted in August are physiologically 'young', their emergence is not uniform and continues over a period of 4–6 weeks so that plant establishment and development are not uniform and most plants develop one or two stems. This behaviour is indicative of 'young seed', that is also referred to as having 'apical dominance' or being at the one sprout stage (Krijthe, 1962). Either cultivars with a relatively short rest period (Slomnicki, 1960) or controlled aging of seed tubers are essential for the success of the autumn crop (Sussnoschi, 1981b; Sorin & Shimshi, 1984). Uniform and rapid plant development gives rapid cover of the field with green leaves, which is important for efficient light interception and for the production of high tuber yields (Allen & Scott, 1980; Sale, 1973). Rapid and uniform growth is particularly important in the autumn season in the Mediterranean region because it maximizes use of the climatic conditions until mid-November when the winter starts. A further constraint is that the high temperatures during late August and most of September inhibit tuber initiation and growth, and enhance haulm growth in some genotypes (Bodlaender, 1963; Levy, 1978; Marinus & Bodlaender, 1975). Hence, cultivars sensitive to heat, such as Up to Date (Bodlaender, 1963; Levy, 1984; Marinus & Bodlaender, 1975), produce vigorous haulm but poor tuber yields in the autumn season (Levy, 1984). On the other hand,

Fig. 1. Climatological data for the experimental periods in 1983 and 1984. Class A pan evaporation: daily mean (○) and highest daily value (■); relative humidity: daily maximum (■) and minimum (○) temperatures, and daylength.


Fig. 1. Données climatologiques pour les périodes expérimentales de 1983 et 1984. Evaporation: moyenne journalière (○) et valeur journalière la plus élevée (■); humidité relative; température maximum journalière (■) et minimum (○), et longueur du jour.