CULTURAL PRACTICES FOR CACTUS PEAR IN ISRAEL FOR YEAR-ROUND PRODUCTION

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Abstract

The Israeli cactus pear cultivar, Ofer, and many other introduced cultivars, ripen in the summer when the market is flooded with summer fruits. Thus, our research effort was devoted to extending the harvesting period of cactus pear in Israel to enable year-round production. Early summer fruits are produced in warm regions or obtained by spraying with GA3 at the beginning of the flowering period in colder regions. A second flush of bud-yielding fruits in the autumn is initiated by using the scozzolature treatment (removing the spring flush at full bloom) commonly practiced in Sicily. Application of fertilizer (N) in the autumn induces budding during the autumn. These fruits are harvested in winter and in early spring

Introduction

A decade ago, when commercial cultivation of cactus pear started in Israel, the harvesting period was relatively short, lasting mainly over July and August. Prices were high for early fruits but decreased markedly as the season progressed because of the abundance of fruits on the market. The aim of this presentation is to describe efforts to extend the marketing period in Israel.

Early Summer Crop

The harvesting period in the summer is influenced by regional temperatures. First fruits ripen in the warm inland Arava valley at the end of June, along the coast and in the hilly plains in mid-July, and in the mountains at the beginning of August. The earlier the spring bud burst, the earlier the fruit ripens. Buds begin to emerge when the average monthly temperature rises to approximately 15-16 °C, i.e., late February in the Arava and 2 to 4 weeks later in other areas. Although the Arava is suitable for an early crop, cactus pear cultivation there is carried out only on a small scale because of competition with the traditional local winter vegetable industry.

Autumn Crop

The scozzolature practice (removing the spring flush at full bloom), is used widely in Sicily to obtain a late crop [Barbera et al., 1992].

Scozzolature treatment has also been successful in Israel and has recently been adopted by farmers. It is applied in May, and fruits are harvested in late August and September. The yield harvested in autumn is slightly lower than that of the regular summer crop (by 15-30%), but the high prices received compensate the farmers for additional labor costs and reduced yield.

Recently, we found that removing fruits at 40-50% of fruit full weight also induces a new flush, which can be stimulated by nitrogen (N) fertilization. Early flowers are borne first on the preceding year's cladodes (fertile cladodes of the spring flush) and then on the current year's cladodes. Although the amount of new flowers is 30% of that produced by the regular crop, some farmers are already using this treatment because it allows them to market fruits in October when prices are high.

Winter Crop

A commercial winter crop, generally smaller than the summer crop, is known in Chile (Russell and Felker 1987a), South Africa (Wessels, 1988), and California (Curtis, 1977). In Israel, autumn bud burst yielding fruits in the winter and the early spring was first observed in continuously fertigated (N-P-K) plantations planted in sandy soil in the Western Negev. Buds emerged on the current year's cladodes, between the end of the summer harvest (August) and the beginning of the winter (November) (Nerd et al., 1991).

Based on our recent studies showing the importance of N to the autumn flush (Nerd et al., 1993), farmers in various regions started applying water with N fertilizer in the autumn in order to stimulate initiation of flower buds. No response was found in the warm valleys (probably because high temperature inhibit budding), in other regions the response was not uniform. Currently, reasonably stable yields (30-60% of the summer crop) are harvested only in the Western Negev. Since the profit margin is very high (prices for winter fruits are three to five times more than those for summer fruits), the area of cactus pear cultivation in the Western Negev is increasing from year to year (from 1.5 ha in 1987 to 30 ha in 1992.

Introduction and Selection of New Germ Plasm.

About 25 different commercial cultivars were introduced from various countries, including South Africa (Wessels, 1988), Sicily (Barbera et al., 1992), Texas (Russell and Felker 1987b) and Chile in 1987-89. One of the aims of the introduction program was to find early or late cultivars. All cultivars are already productive. Many ripen simultaneously with the local cultivar, Ofer, and others slightly later (green cultivars introduced from Chile and Texas). This indicates that more attention has to be paid to other sources of germ plasm, such as wild populations or mutations in order to select or breed out-of-season cultivars. An investigation of local Israeli germ plasm by our group revealed a promising clone producing seedless and early fruits (BS 1) (Weiss et al., 1993). The earliness was associated with the absence of a seed-growth phase. A market study of BS 1 fruits is currently being conducted.

Effect of Chemicals on Bud Initiation and Fruit Growth

Spraying cladodes of the current year in autumn with the cytokinin, benzyladenine (BA), stimulated the initiation of flower buds. In some cases more than one bud was initiated from an areole. Since the effect of BA on budding was very small, its use for increasing the autumn flush was not recommended.

The gibberellin, gibberellic acid (GA3), was found by Diaz and Gill (1978) to induce late ripening when sprayed at progressive stages of fruit development. Our studies show that if GA3 (50-450 ppm) was sprayed at the beginning of the flowering period, the fruit growth period was shortened and early ripening occurred. Fruits that developed from buds that were at an advanced stage of development (two weeks or less before anthesis) started to ripen about 10-14 days before those of the control plants. The size, peel/core ratio and total soluble solids (TSS) of fruits that developed from the treated buds were similar to those for non-treated plants. The number of seeds was 40-70% lower than in the control. The 25% of fruits that ripen early as a result of the GA3 treatment have high economic value, which justifies the development of this practice for producing an early crop.

Summary

The production of out-of season crops is the main factor in the profitability of cactus pear in Israel. The budding flexibility of this species, as controlled by various agrotechniques, enables the extension of the harvesting period (Table 1). Later crops are smaller than the main summer crop and further research on the physiology of cactus pear flowering is required to improve yield.

Table 1. Effect of region and treatments on ripening period of *Opuntia ficus-indica* (Ofer) in Israel

			Ripening period											
Region	Budding period	Treat	J	J	A	S	O	N	D	J	F	M	A	M
Warm valleys	End of Feb-Mar	----	xxxxx											
Coast, hills	Mid Mar-Apr	GA_3		xxxxx										
	Mid Mar-Apr	----		xxxxx										
	May-June	Scozz.				xxxxx								
	Aug-Sept	N						xxxxxxxxxxxxxxxxxx						
Mountains	Apr	----			xxxx									

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