

Effects of Single and Double Cropping on Yields of Fall Bearing Raspberries

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Abstract

Yields of 4 cultivars of fall bearing red raspberries grown under a system of single and double cropping were evaluated. It was determined that under central Illinois conditions, yields of single cropped fall bearing red raspberries decreased yearly. Annual yields of the same cultivars grown under conventional double cropping systems remained nearly constant over the same time interval. When the relative yields of the fall and spring crops in the double cropping system were compared, it was noted that the yield of the fall crop decreased yearly. In this same period, the yield of the spring crop increased annually. The results suggest that harvesting the single fall crop could result in significant yield loss due to the drastic pruning procedures and the tendency of the plants to produce increasingly larger spring than fall crops.

Introduction

In recent years the popularity of red raspberries has steadily increased, but the availability of this fruit to the public in the fresh form has significantly decreased. When raspberries are available, the price is usually high because of the fruit's extreme susceptibility to molds. Red raspberries sold for fresh market purposes are generally hand picked. It takes longer to pick a quantity of raspberries than other small fruits because the harvest period is long and, therefore, only small daily yields are obtained from individual plants. The large amount of hand labor required to harvest every 2-3 days has become so expensive that many commercial raspberry farms have either ceased production, switched crops, reduced commercial acreage or become "pick-your-own" operations. Red raspberries are tradi-

tionally grown under cultural conditions which include variation on the hill system or hedgerow with or without trellising. The labor involved in growing raspberries (or any bramble crop) with these systems is intensive (3). These problems, in conjunction with the national problem of obtaining farm labor, have contributed to the unavailability of raspberries.

The Cornell University small fruit workers were among the first to suggest an alternate system for growing red raspberries which would eliminate hand pruning.* Their system utilizes the ability of fall bearing red raspberries to produce fruit on *primocanes* (first year growth) whereas non-fall-bearing raspberries produce fruit only on *floricanes* (second year growth). Under their system, erect fall bearing raspberries are grown in a hedgerow and are pruned to the ground level when the plants are dormant (late winter or late fall). Primocanes which then develop will produce a single crop in the late summer through early fall. Production under this system will, of course, yield only a single crop of raspberries instead of the potential two crops. However, the elimination of all hand pruning is considered by many commercial growers to be a sufficient justification for sacrificing the spring crop (1, 2).

The long-term effects of this drastic pruning system on plants and yields of raspberries are not known. This ex-

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periment was designed to study the effects of single cropping vs. double cropping on yield potential of several fall bearing raspberry cultivars.

Procedures

In 1973, 5 cultivars of erect fall bearing raspberries (Fallgold, Fallred, Heritage, September, and Southland) were selected and planted in hedgerows with 0.6 m between plants and 3.0 m between rows. Each of the cultivars was planted in 4 hedgerows within a completely randomized design. Two hedgerows for each cultivar were designated to be mowed each spring to yield a single crop of fruit ("single cropping") while the other 2 hedgerows were to be grown under conventional systems of pruning and "double cropping." Overhead irrigation was provided to give the plants a minimum of 2.5 cm of water per week during the growing season. A pesticide program was also maintained to control weeds and parasites. This experiment was conducted under the conventional fertilization recommendations for the state of Illinois of 45 kg N/Ha (40 lbs N/A).

By 1974, the hedgerows did not have a sufficiently solid stand to begin

a good test. Plants were added to form solid rows. Southland was found to be virus-infected and was rogued from the experiment. No data were gathered in that year. In 1975 and the subsequent 2 years, all fruit was harvested. Double cropped canes were pruned after bearing the spring crop. The removal of all canes in the single cropping hedgerows was completed in the early spring while the ground was frozen. The canes were mowed as close to the ground as possible. The primocanes produced a crop beginning in late July which continued through the season until a killing frost occurred. Yields were combined to produce total yields for both spring and summer crops when appropriate.

Results

Unmowed (Double Cropping)—Under the conventional double cropping system of fall bearing raspberry culture, the total yield per hectare of the 4 cultivars varied only slightly over the 3-year period (Table 1). However, it can be noted that the relative proportions of crops harvested in the spring and summer shifted significantly over the interval. In 1975, the fall crop was about 2 times that

Table 1. Total yields of 4 cultivars of fall bearing raspberry under a system of double and single cropping.

TREATMENT	Projected Yield Per Hectare (Metric Tons)			TOTAL
	1975	1976	1977	
UNMOWED				
SPRING	4.02a ¹	5.14 ns	7.16b	16.32 ns
FALL	7.13b	5.10 ns	3.71a	15.94 ns
TOTAL	11.15	10.24	10.87	32.36
MOWED				
SPRING	—	—	—	—
FALL	9.13b	5.78 ns	4.47a	19.38 ns
% OF UNMOWED TOTAL	81.90	56.40	41.10	59.80

¹Means within columns followed by different letters are significantly different at the 5% level by LSD.

of the spring crop; in 1976, the spring and fall crops were statistically the same; and in 1977, the spring crop was almost 2 times that of the fall crop. When this phenomenon is examined at the cultivar level, the same general trend was noted (Table 2) with the spring crop generally increasing in size and the fall crop decreasing over the 3-year period.

Mowed (Single Cropping)—When the yields of the 4 cultivars were combined yearly, there was a marked trend towards lower total yields as the age of the planting increased (Table 1). When this change in yield was examined by cultivar (Table 2), it was obvious that there were cultivar differences with September not exhibiting the rapid decline in yields associated with the other cultivars.

Discussion

The rapid drop in total yield associated with single cropping of these raspberries indicated that decreased fall yields over prolonged periods of culture may be a problem. However, fall yields of the double cropped plants also decreased. A comparison

of the fall crop of the unmowed (double crop) system with that of the mowed (single crop) system (Table 1, Fig. 1) shows no significant difference among the treatments; yields of the mowed and unmowed fall crop are statistically the same. If this is the case, there are probably other factors which influence the yields of the fall crop in addition to mowing.

Yields of the single cropped raspberries decreased at a slightly faster rate than the double cropped plants. It could be that this difference is due to reduced vigor which is related to loss of photosynthates in the single cropped plants in conjunction with the drastic pruning of 1-year-old wood and the stress of producing an entirely new cane system yearly. Another factor could be that the nutrient status was not high enough to insure sufficient cane growth to produce a large fall crop. Subsequently, we have learned that the New York Agricultural Experiment Station tentatively recommends a fertilization rate of about 109 kg N/Ha (100 lbs N/A) under a single cropping system for raspberries.*

Table 2. Yield of fall bearing raspberries under 2 cultural conditions (1975-1977) at Urbana, Illinois.

Cultivar	Treatment	Projected Yield per hectare (metric tons)									3-yr. total
		1975			1976			1977			
		Spring	Fall	Total	Spring	Fall	Total	Spring	Fall	Total	
Fallgold	Unmowed ^a	3.54	2.85	6.39	3.81	1.07	4.87	5.73	0.80	6.53	17.79
	Mowed ^b		6.61	6.61		2.43	2.43		1.24	1.24	10.28
Fallred	Unmowed	4.59	8.67	13.26	5.10	5.41	10.51	7.95	3.05	11.00	34.77
	Mowed		11.75	11.75		8.08	8.08		4.22	4.22	24.05
Heritage	Unmowed	3.25	11.27	14.52	7.64	8.23	15.87	8.81	7.03	15.84	46.23
	Mowed		12.71	12.71		8.09	8.09		7.24	7.24	28.04
September	Unmowed	4.71	5.74	10.45	4.01	5.67	9.68	6.14	3.97	10.11	30.24
	Mowed		5.43	5.43		4.53	4.53		5.18	5.18	15.14

^aUnmowed = plants grown under convention 2-crop system for fall bearing raspberries.

^bMowed = plants mowed to ground level in the spring to yield only a fall crop of fruit.

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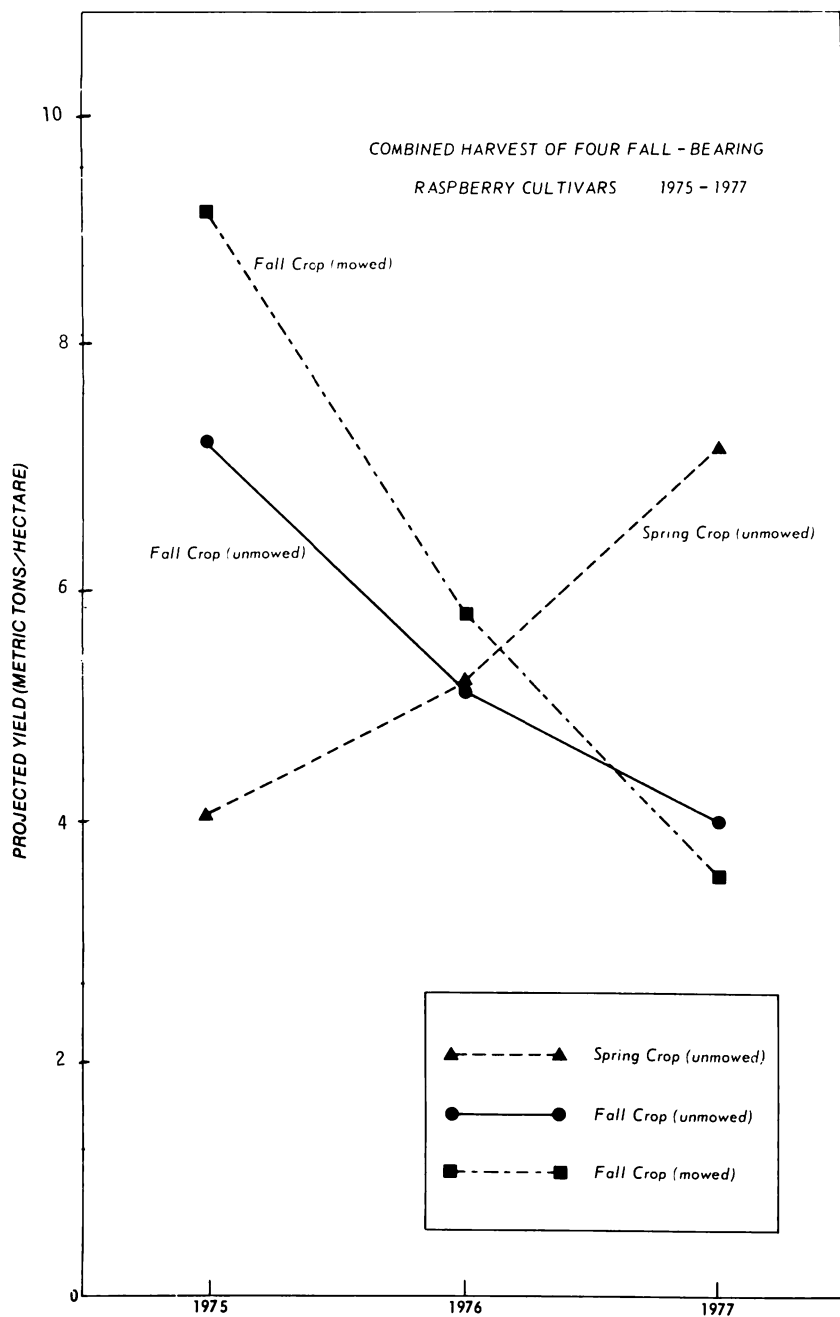


Fig. 1. Total spring and fall yields of four fall bearing raspberry cultivars grown under a system of single and double cropping (mowed and unmowed, respectively)—1975-1977.

As a 3-year total, the yields of single cropped raspberries are approximately 50% that of the double-cropped raspberries (Table 1).

An increase in total yield of at least 2 times may justify the additional pruning, maintenance, and picking associated with the double cropping

system. Even with the decreasing yields discussed above, however, the reduced labor associated with the single cropping system of growing raspberries should prove profitable to many growers, particularly pick-your-own operations.

Literature Cited

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BOOK REVIEW

Approval Practices in Fruit and Vine Production. 2nd Edition. A. H. Scheer and E. M. Juergenson. Interstate Printers. 548 pages. \$7.50

This is a very reasonably priced elementary textbook on fruit production suitable for a course on this subject at the secondary school level. Primarily directed toward production in the southwest, it covers most of the important fruit production practices rather well.

There are, however, some glaring omissions, in my opinion, which prevent this book from being as universally useful as it could be. A few examples will clarify my point. Any student looking for information on apple rootstocks will find little on the subject in this book. No mention is

made of the relatively new integrated approach to pest control. Nor is there any discussion on application equipment and techniques for control of insects and diseases.

Chemical weed control, a vital part of any fruit growing operation, is omitted. Another missing subject is fruit storage on the farm, very important in the east and midwest, although probably not in California. The section on small fruits does not include blueberry, and one of our most important fruits, the strawberry; and it is so sketchy on raspberries, that I wonder if the authors would not have been wise to have left it out entirely.

—G. M. Kessler
