TABLE I

No. trees studied	Aver. diam. breast-high	No. shoots studied	Sex on shoots	Aver. length of shoots Apr. 8, 1931 mm	Aver. length of shoots Sept. 11, 1931 mm	Aver. length of leaves Apr. 8, 1931 mm	Aver. length of leaves Sept. 11, 1931 mm	Shoots dead, May, 1932 No.	Shoots dead, May, 1932 Per cent.	No. strobili on shoots Max.	No. strobili on shoots Min.	No. strobili on shoots Aver.
15	19.0 cms	51	Vegetative	68.4	102.4	0	302.2	3	6	—	—	—
		18	Pistillate	93.0	162.0	0	318.0	0	0	2	1	1.5
		89	Staminate	36.6	74.1	0	283.5	28	31	72	2	19.2

In Table I are given the measurements of the shoots and the sex of flowers they bore. Those which bore no strobili were for convenience designated as vegetative shoots. The results show that in all the 89 shoots bearing the staminate strobili the amount of the growth they had made was very small. In the early spring the shoots bearing the pistillate strobili were the largest and were nearly three times as long as those bearing the staminate strobili. Those bearing no strobili, or the vegetative shoots, were at the start about two thirds the length of those bearing the pistillate strobili and about twice as long as those bearing the staminate strobili. At about the end of the growing season the stems produced by the shoots bearing the pistillate strobili (which by now had been pollinated) were twice the length of the stems produced by those bearing the staminate strobili, while the stems produced by the vegetative shoots were about one and one half times as long as those produced by the male-bearing.

Another point of interest is the relation between the number of staminate strobili and the size of the shoot that bore them. In all cases it was evident that the shoots bearing the smaller number of staminate strobili were larger than those bearing the larger number of male flowers. In other words, the amount of growth made by the shoots bearing the staminate strobili varied inversely with the number of the strobili. This would indicate that the production of the staminate strobili caused a retardation in the growth of the terminal shoots bearing those strobili. On the other hand, the production of the pistillate strobili apparently caused a stimulation of the growth of the shoots that bore them, for in all cases those bearing the pistillate strobili were larger than those which bore no strobili. Field observation of mature trees showed, however, that the upper branches of the trees which were vigorous bore pistillate strobili, while those on the lower part of the tree bore the staminate strobili, suggesting that staminate strobili were produced on weaker branches. This then suggests the question of whether the slow growth of the shoots bearing the staminate strobili was due to their natural weak condition or whether the shoot actually suffered a retardation in growth produced by the staminate strobili. In other words, the question is: "Which is the cause and which the effect?"

A point in favor of the theory that the production of the pistillate strobili cause a stimulation in the growth of the shoot is shown by the greater growth of the needles on the shoots bearing the pistillate strobili than on those bearing the staminate strobili or on the vegetative shoots (see Table I).

It was also found by the end of the summer that while none of the pistillate shoots died, 6 per cent. of the vegetative shoots and 31 per cent. of the shoots bearing staminate strobili had died due to insect infection.

In August, 1932, the area was again visited and observation made on the tagged shoots in order to determine whether the development of the pistillate cones after fertilization might retard the terminal growth of that branch during the development of the cones. It was found that six of the branches bearing the pistillate cones had long new shoots. Five of the pistillate cones examined during 1931 were destroyed by insects, but the terminal growth of that year (1932) was as long as during the previous year. However, as many of the tips of the branches bearing the staminate strobili in 1931 showed no growth in 1932, no further notes were made.

In conclusion, it may be stated that the question of the effect of flower production on the rate of growth of terminal shoots of pine is an open one and presents an excellent problem for further investigation.

L. J. PESSIN
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