



Performance of Fruit Crop Modules Under Rainfed Conditions

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ABSTRACT

The present experiment entitled "Performance of fruit crop modules under rainfed conditions" was carried out at Research farm, Horticulture section, College of Agriculture, Dhule under Mahatma Phule Krishi Vidhyapeeth, Rahuri during 2016-17. The experiment was set in Randomized Block Design with eight treatments and five replications. The treatment comprised of different fruit crop combinations designated as Module-1 comprised of (Mango + Custard apple + Aonla + Drumstick), Module2 (Mango + Custardapple + Aonla) and Module-3 (Mango + Custard apple + Jamun) along with sole of each crop under the modules. Experimental results showed that in general there was reduction in growth characters of all the component crops in modules as compared to sole crop, but the reduction was less in the fruit crop combination i.e the treatment T₂ (Mango+ Custard apple +Aonla) indicating the better adaptability of these crops to the rainfed conditions. As regards the days required to harvest fruits from flowering, the delayed harvesting was observed in all the component crops in the modules, but the delay was minimum in the treatment T₂ (Mango+ Custard apple +Aonla). In spite of decrease in number of fruits/plant, mango, custard apple and aonla in treatment T₂ (Mango + Custard apple +Aonla) produced 267.80 fruits, 304.40 fruits and 2120.60 fruits/plant, respectively which was higher than observed in the other modules (T₁ and T₃). Mango, custard apple and aonla among the modules (T₁ and T₃) recorded 162.40 g, 156.50 g and 31.38 g fruit weight, respectively. The crops Mango and custard apple the highest yield (kg/plant) as well as yield (t/ha) in the treatment T₂ (Mango + Custard apple +Aonla). As regards yield (kg/plant), mango and custard apple recorded 43.49 kg, and 47.79 kg yield/plant, respectively, which was 20.83 %, and 5.63 % higher than the other modules (T₁ and T₃). In aonla, there was reduction in yield (kg/plant), but reduction was less in the treatment T₂. With respect to the yield (t/ha), same trend was observed. The crops namely mango and custard apple recorded 4.35t, and 4.30t yield/ha, respectively, which was 20.83 %, and 5.65% higher than the other modules (T₁ and T₃).

Key words: Mango fruit crop, growth, yield

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INTRODUCTION

In India, farming is the source of livelihood and still 70 per cent of the population is dependent on the agriculture and therefore it remained the largest sector of Indian Economy. But it's output share fell from 28.3% in 1993-94 to 14.4% in 2011-12, employment share declined from 64.8% to 48.9% over the same period. This is because of uncertain income from this sector leading to insecurity amongst the farmer. Moreover, agriculture sector is facing severe problems such as climate change, small land holding due to fragmentation, shrinking of land due to increasing population pressure and divergence of land for non-agricultural uses such as dams, highways, industries, degradation of soil due to salinity, etc. Of these, small land holding size is one of important reasons for poor income of the farmers. Seventy per cent of the world small farms are in China and India. China and India accounts for 193 (47 %) and 93 million (23 %) small farms out of 404 million small farms in the world. As per estimates, in India, more than 95 % holdings are under the category of small and marginal holders by 2050 [2-7, 8-10]. Hence, the present objective of farming should be the sustainable yields and generation of more income to the farmers by efficient utilization of natural resources along with nutritional security and ecological restoration. NITI Ayog is also emphasizing on the same object [1]. However, there is need to develop strategies that enhance quality and productivity of crops under reducing land, declining natural resources, increasing biotic and abiotic stresses and ever increasing population. Achieving

sustainable yield and generating more income to the farmers is seems to be impossible through monocropping as it has caused series of serious problems.

MATERIAL AND METHODS

Field experiment entitled, "Performance of Fruit Crop Modules under Rainfed Conditions" was carried out at Research Farm of Horticulture Section, College of Agriculture, Dhule during the year 2016-2017. Present research programme was laid out in Randomized Block Design consisting of five replications. The experiment was laid out in Randomized Block Design (RBD) with eight treatments which were replicated five times and each treatment comprised of a unit of 1 (one) plant [9]. The treatments were assigned randomly in each replication. Treatment details are depicted in the Table.

Treat	Treatment details
T1	Module-1 (Mango + Custard apple + Aonla + Drumstick)
T2	Module-2 (Mango + Custard apple + Aonla)
T3	Module-3 (Mango + Custard apple + Jamun)
T4	Mango sole crop
T5	Custard apple sole crop
T6	Aonla sole crop
T7	Jamun Sole crop
T8	Drumstick sole crop

RESULTS AND DISCUSSION

Number of fruits per plant

All treatments significantly differed in their effect. However, the treatment T₂ - (Mango + Custard apple + Aonla) recorded significantly highest number of fruits per plant (267.8). This treatment followed by the treatment T₁ - (Mango + Custard apple + Aonla + Drumstick) which produced 244.2 fruits per plant. With respect to custard apple, significantly the highest fruits per plant (304.4) were registered in the treatment T₂ - (Mango + Custard apple + Aonla). Reduction in number of fruits per was observed in the treatments T₃ - (Mango+ Custard apple + Jamun) and T₁ - (Mango+ Custard apple + Aonla + Drumstick) as compared to the sole crop. In Aonla, reduction in the number of fruits per plant was observed in the treatments T₂ - (Mango + Custard apple + Aonla) and T₁ - (Mango+ Custard apple + Aonla + Drumstick) as compared to the sole crop (T₆). However, the reduction was less in the treatment T₂. This treatment produced 2120.6 number of fruits per plant. In Jamun, maximum fruits per plant (481.7 fruits) were observed in T₇ - (Sole jamun crop), while minimum fruits per plant (448.2 fruits) were observed in T₃ - (Mango + Custard apple + Jamun). Means there was reduction in number fruits as compared their sole crop. In drumstick, maximum (207.0 fruits) and minimum (175.0 fruits) number of fruits per plant were observed in the treatments T₈ - sole drumstick and T₁ - (Mango+ Custard apple + Aonla + Drumstick), respectively. Means there was reduction in number fruits as compared their sole crop.

Average fruit weight (g)

The data with regard to average fruit weight per plant been depicted in table-2. It very apparent from the data that all the component fruit crops in the modules had significant effect on fruit weight. Significantly the highest fruit weight (162.40 g) was recorded in the treatment T₂ - (Mango + Custard apple + Aonla). This treatment was followed by the treatment T₄ - Sole mango crop which registered 158.40 g fruit weight. Reduction in fruit weight was noted in the treatments T₁ - (Mango + Custard apple + Aonla + Drumstick) with 153.40 g fruit weight and T₃ - (Mango + Custard apple + Jamun) with 153.20. However, these treatments were on par with each other. In the custard apple, the significantly highest fruit weight (156.50) was registered in the treatment T₂ - (Mango + Custard apple + Aonla). However, there was reduction in the fruit as compared to T₅ - Sole custard apple crop (158.39). Reduction in fruit weight was more in the treatments T₁ - (Mango + Custard apple + Aonla + Drumstick) with 153.33 g fruit weight and T₃ - (Mango + Custard apple + Jamun) with 153.20 g fruit weight. In Aonla fruit crop, maximum fruit weight of 37.44 g was observed in the T₆ treatment i.e. (Sole Aonla crop) as compared to the modules.

Although there was reduction in the fruit weight in Aonal, the reduction was minimum in the T₂ -(Mango + Custard apple + Aonla).In Jamun, maximum and minimum fruit weight was observed in the treatments T₃ - (Mango + Custard apple + Jamun) and T₇ - sole jamun crop which registered 12.30 g and 13.17 g, respectively. In drumstick, the highest (52.38 g) and the lowest (47.96 g) fruit weight was observed in the treatments T₈ - Sole drumstick and in the treatment T₁ - (Mango + Custard apple + Aonla + Drumstick), respectively. In this crop also there was reduction in fruit weight as compared to their sole crop.

Yield (kg plant⁻¹)

As noticed from the Table 3 the yield per plant was significantly influenced due to the constituent fruit crops in the modules. Significantly, the highest yield per plant (43.49 kg) was recorded in the treatment T₂ - (Mango + Custard apple + Aonla). The treatments T₄ (Sole crop of mango), T₃ - (Mango + Custard apple + Jamun) and T₁ - (Mango + Custard apple + Aonla + Drumstick) were on par with each other. The results also revealed decrease in the yield as compared to the sole mango crop (T₄). In custard apple, significantly the highest fruit yield per plant (47.79 kg) was observed in T₂ - (Mango + Custard apple + Aonla). The lowest fruit yield per plant (31.55 kg/plant) was observed in the treatment T₃ - (Mango + Custard apple + Jamun). The results also revealed decrease in the yield as compared to the sole custard apple crop (T₅). The results also showed decrease in the yield as compared to the sole aonla crop (T₆). In Jamun, maximum fruit yield per plant (3.88 kg) was observed in T₇ - (Sole jamun crop) and minimum fruit yield (3.63 kg) per plant was observed in T₃ - (Mango + Custard apple + Jamun). In this crop also reduction in fruit yield was perceived as compared to the sole jamun crop. In drumstick, maximum fruit yield per plant (12.91kg) was observed in T₈ -(Sole drumstick crop) and minimum fruit yield per plant (10.13 kg) was observed in T₁ - (Mango + Custard apple + Aonla + Drumstick). As apparent from the table, reduction in fruit yield was perceived as compared to the sole Drumstick crop.

Table 01.Number of fruits per plant different fruit crops under modules and as sole crops.

Treatment	Number of fruits per plant				
	Mango	Custard apple	Aonla	Jamun	Drumstick
T ₁ .Module-1 (Mango+ C. apple + Aonla + Drumstick)	244.20 (+7.48)	267.00 (-5.46)	1960.4 (-13.72)	--	175.0 (-15.46)
T ₂ .Module -2 (Mango + C.apple + Aonla)	267.80 (+17.86)	304.40 (+7.79)	2120.6 (-6.70)	--	--
T ₃ .Module -3 (Mango + C. apple + Jamun)	239.80 (+5.54)	206.00 (-27.06)	--	448.2 (-6.95)	--
T ₄ - Sole mango	227.20	--	--	--	--
T ₅ - Sole custard Apple	--	282.40	--	--	--
T ₆ - Sole Aonla	--	--	2272.0	--	--
T ₇ - Sole Jamun	--	--	--	481.7	--
T ₈ -Sole Drumstick	--	--	--	--	207.0
S.E.+	0.803	0.941	--	--	--
C.D at 5%	2.474	2.901	--	--	--

(Figure in bracket indicate the per cent decrease or increase over sole crop)

Table 02. Average weight of fruits (g) of different fruit crops under modules and in sole crops.

Treatment	Average weight of fruits (g)				
	Mango	Custard apple	Aonla	Jamun	Drumstick
T ₁ -Module-1 (Mango+ C. apple + Aonla + Drumstick)	153.40 (-3.16)	153.33 (-3.29)	29.80 (-20.41)	--	47.96 (-8.44)
T ₂ -Module -2 (Mango + C. apple + Aonla)	162.40 (+2.52)	156.50 (-1.29)	31.38 (-16.19)	--	--
T ₃ -Module -3 (Mango + C. apple + Jamun)	153.20 (-3.29)	153.20 (-3.28)	--	12.30 (-6.61)	--
T ₄ - Sole mango	158.40	--	--	--	--
T ₅ - Sole custard Apple	--	158.39	--	--	--
T ₆ - Sole Aonla	--	--	37.44	--	--
T ₇ - Sole Jamun	--	--	--	13.17	--
T ₈ -Sole Drumstick	--	--	--	--	52.38
S.E.+	0.992	1.272	--	--	--
C.D at 5%	3.058	3.920	--	--	--

(Figure in bracket indicate the per cent decrease or increase over sole crop)

Table 03.Yield per plant (kg) different fruit crops under modules and in sole crop.

Treatment	Yield per plant (kg/plant)				
	Mango	Custard apple	Aonla	Jamun	Drumstick
T ₁ -Module-1 (Mango+ C. apple + Aonla + Drumstick)	37.46 (+4.08)	40.97 (-9.47)	61.51 (-27.69)	--	10.13 (-21.54)
T ₂ -Module -2 (Mango + C. apple + Aonla)	43.49 (+20.83)	47.79 (+5.039)	63.19 (-25.72)	--	--
T ₃ -Module -3 (Mango + C. apple + Jamun)	40.36 (+12.14)	31.55 (-30.26)	--	3.63 (-6.45)	--
T ₄ - Sole mango	35.99	--	--	--	--
T ₅ - Sole custard Apple	--	45.24	--	--	--
T ₆ - Sole Aonla	--	--	85.06	--	--
T ₇ - Sole Jamun	--	--	--	3.88	--
T ₈ -Sole Drumstick	--	--	--	--	12.91
S.E.+	1.77	0.65	--	--	--
C.D at 5%	5.46	1.99	--	--	--

(Figure in bracket indicate the per cent decrease or increase over sole crop)

Table 04. Yield per hectare (t/ha) different fruit crops under modules and in sole crops.

Treatment	Yield per hectare (t/ha)				
	Mango	Custard apple	Aonla	Jamun	Drumstick
T ₁ -Module-1 (Mango+ C. apple + Aonla + Drumstick)	3.75 (+4.16)	3.69 (-9.34)	5.11 (-70.55)	--	0.91 (-88.73)
T ₂ -Module -2 (Mango + C. apple + Aonla)	4.35 (+20.83)	4.30 (-5.65)	11.37 (-34.47)	--	--
T ₃ -Module -3 (Mango + C. apple + Jamun)	4.04 (+12.22)	2.84 (-30.23)	--	0.65 (+71.05)	--
T ₄ - Sole mango	3.60	--	--	--	--
T ₅ - Sole custard Apple	--	4.07	--	--	--
T ₆ - Sole Aonla	--	--	17.35	--	--
T ₇ - Sole Jamun	--	--	--	0.38	--
T ₈ -Sole Drumstick	--	--	--	--	8.07
S.E.+	0.177	0.30	--	--	--
C.D at 5%	0.546	0.92	--	--	--

(Figure in bracket indicate the per cent decrease or increase over sole crop)

Yield (t/ha)

As noticed from the Table 4. Mango fruit crop exhibited the same trend as in number of fruits and average fruit weight. Here, in this character also, T₂ - (Mango + Custard apple + Aonla) recorded the highest yield per hectare (4.35 t ha⁻¹) followed by the treatment T₄ i.e. sole crop of mango which produced 4.04 t/ha yield. In this character in mango, it is striking that the increase in yield over sole was observed. In custard apple, significantly highest yield of 4.30 t ha⁻¹ was observed in the treatment T₂ - (Mango + Custard apple + Aonla). Lowest yield was observed in the treatment T₃ - (Mango + Custard apple + Jamun) which was 2.84 t ha⁻¹. Further, decrease in the yield as compared to the sole crop was observed. In aonla, maximum fruit yield (17.354 t ha⁻¹) was observed in T₆ - sole aonla crop, while minimum yield (5.112 t ha⁻¹) was observed in T₁ - (Mango + Custard apple + Aonla + Drumstick). Further, decrease in the yield as compared to the sole crop was observed. In jamun, the highest yield (0.65 t ha⁻¹) was observed in T₃ - (Mango + Custard apple + Jamun) and minimum yield (0.38 t ha⁻¹) in T₇ - (Sole jamun crop). In drumstick, maximum fruit yield (8.07 t ha⁻¹) was observed in T₈ - sole drumstick, and the lowest yield (0.91 t ha⁻¹) was observed in T₁ - (Mango + Custard apple + Aonla + Drumstick). Here also, decrease in the yield as compared to the sole crop was observed.

CONCLUSION

Based on the entire results of the present investigation, it can be concluded that, the T₂ comprised of Mango + Custard apple + Aonla fruit crops is found most suitable and remunerative under dryland conditions considering their appreciable growth performance, the highest equivalent yield of 12.44 t/ha and maximum monetary returns of Rs. 2,76,000=00 with a BCR ratio of: 3.84. The crops under T₂ (Mango + Custard apple + Aonla) are compatible with each other, and could be adjudged as the best companion fruit crops.

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