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Intercropping of solonaceous vegetables in mulberry- a profitable way to farming community

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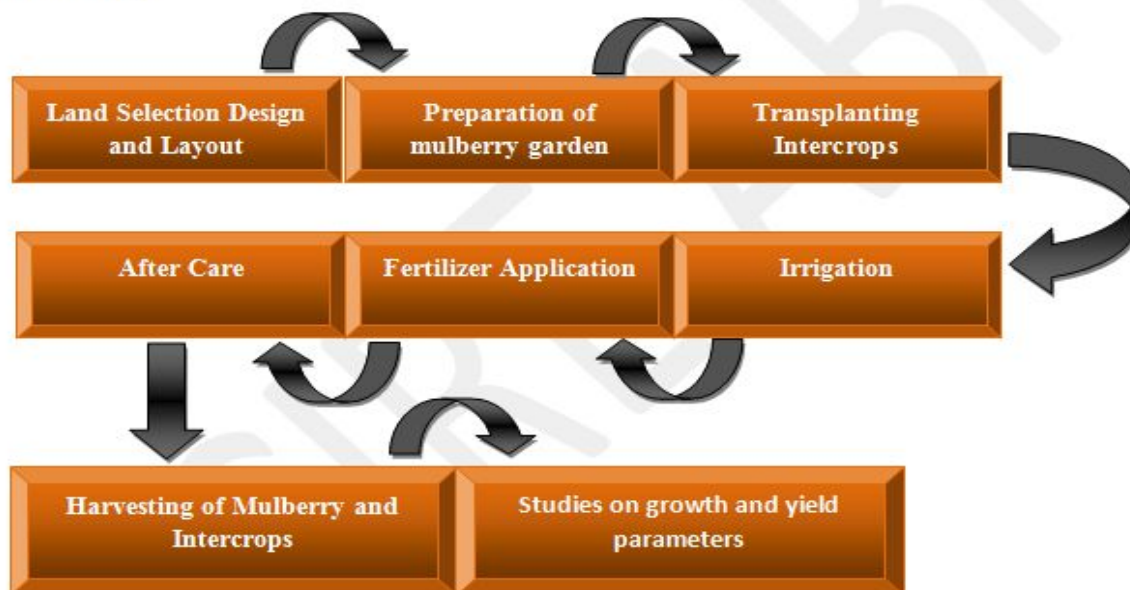
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Objective: Research was conducted for effective utilization of the space available in between the rows of mulberry garden through intercropping of solonaceous vegetables that can improve the soil fertility and profit.

Methodology:



Duration taken for the research: One year

Conclusion: If one crop fails, the other crop (intercrop) holds to profit

Applicable Industries: Farming and agriculture

Expected outcome: Raise in net return

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Abstract

Field investigation on “Feasibility of intercropping of solonaceous vegetables in mulberry” was carried out at farmer’s field in Bhaktharahalli village, Sidlaghatta taluk and Chikkaballapur district of Karnataka state during Kharif 2014, with the objective to know the growth and yield of mulberry under solonaceous intercropping system. Study revealed that significantly higher growth parameters was recorded in sole mulberry treatment at 60 days after pruning compared to other intercropping treatment combinations with plant height (159.43 cm), number of branches per plant (13.31), number of leaves per plant (121.81), which attributed to the higher leaf yield of 5.81 t ha⁻¹ crop⁻¹. A higher net return (INR. 5, 81,996/- ha⁻¹ crop⁻¹) was obtained from mulberry and tomato intercropping system and higher cost benefit ratio (3.61) was obtained from mulberry and Brinjal intercropping system respectively.

Key words: Growth, yield, mulberry, solonaceous vegetables and intercropping.

Introduction

Sericulture is deep rooted in the culture and tradition of Indian society endowed with salubrious climate. It is remarkable for its low investment, quick and high returns, besides providing self-employment opportunity. The industry is also attractive particularly to small and marginal farmers, mainly because of regular source of income. In the global contest, India is the second largest raw silk producing country next to china. Karnataka state enjoys favourable climatic conditions throughout the year both for mulberry leaf production and silkworm rearing. As per 2012-2013 Annual report on Highlights of central silk board’s activities, it occupies a prominent place in the sericulture map contributing about 9236MT of raw silk from 1,66,000 hectares of mulberry garden and accounts for 65.75 per cent of mulberry raw silk production and mulberry is growing in all the districts of Karnataka, major area is from Kolar district (33025 ha).

The ever increasing need for food, clothing and shelter from the limited land on account of sky rocketed increase in human population, has forced man to evolve the means for increasing the economic returns from unit area of land. In this context, multicropping and intercropping are the economically viable alternatives which mainly emphasize on diversification of crops and intensification of land use.

The importance of intercropping in farming practice has been recognised in India for many centuries and the Indian farmers are practicing this system in some or the other form. The main objective of intercropping is to get increased productivity per unit area and time. This also helps in equitable and

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judicious utilization of land resources and farming inputs including labour. The main objective of the intercropping in mulberry is to grow short duration crops between the rows of mulberry without affecting the quantity and quality of mulberry leaf.

Material and methods

An investigation entitled “Feasibility of intercropping of solonaceous vegetables in mulberry” was carried out during 2014-2015 at farmer’s field in Bhaktharahalli village, Chikkaballapur district. This is located in eastern dry zone of Karnataka.

Location of the experimental site

Research was conducted during Kharif season from August to November of 2014 on clay loam soils in farmer’s field in Bhaktharahalli village, Chikkaballapur which is located at latitude of 13°08’ north, a longitude of 78°08’ east and at an altitude of 918 m above mean sea level in eastern dry zone (Zone 5) of Karnataka. Prior to the laying out of experiment, composite soil samples were drawn from the experimental site and analyzed for physical and chemical properties.

The field trial was laid out in a randomized complete block design (RCBD) with seven treatments and three replications.

Intercrops used in the experiment

Potato (Kufri Surya), **Chilly** (Arka Sweta), **Brinjal** (Arka Anand), **Tomato** (Arka Rakshak), **Capsicum** (Bell pepper) **paprika** (Arka Mohini), **Pungent capsicum** (Arka Gaurav).

Treatment details

T₁: Potato + Mulberry

T₂: Chilli + Mulberry

T₃: Tomato + Mulberry

T₄: Brinjal + Mulberry

T₅: Capsicum bell pepper + Mulberry

T₆: Pungent capsicum

T₇: Sole mulberry

✓ Intercrop row proportion: One row of intercrop between mulberry crop

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Saplings and transplanting of intercrops

Potato tubers required about 40,000 in number per hectare, chilli saplings about 30,000 per hectare, whereas tomato saplings of around 18,000 per hectare, brinjal saplings of about 18,700 per hectare and capsicum (both bell pepper and pungent capsicum) about 35,000 saplings per hectare respectively. Healthy seedlings aged between 25 to 30 days with four fully expanded leaves were transplanted. Transplant in the evening to avoid mid-day wilt but ensure that soil moisture is adequate at transplanting addition of organic matter (200-300g/hill) to planting holes facilitate quick establishment of the transplant. These saplings were transplanted on 10th August as per the treatment, with definite spacing.

After care

- Gap filling and weeding
- Irrigation
- Fertilizer application

Results

Effect of intercropping different solonaceous crops on growth and yield of mulberry

Growth components

The data on growth and yield parameters of V1 mulberry variety as influenced by intercropping of different solonaceous crops under irrigated condition are presented below

Plant height (cm)

Plant height at 60 DAP was significant higher in sole mulberry (159.43 cm) which was on par with the mulberry intercropped with Brinjal, tomato and chilli. However, least plant height (125.30) was noticed in mulberry intercropped with pungent capsicum (Table 1)

Number of branches per plant

Significantly higher number of branches per plant at 60 DAPS was found in sole mulberry (13.31) which was on par with mulberry intercropped with tomato and brinjal (12.55), the significantly lowest number of branches were recorded in mulberry intercropped with pungent capsicum (9.91) (Table 1)

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Table 1: Growth and yield parameters as influenced by solonaceous intercropping at different growth stages of mulberry

Treatments	Plant height (cm)	No. of branches plant ⁻¹	No. of leaves plant ⁻¹	Mulberry leaf yield plant ⁻¹ (g)
	60 DAS	60 DAS		
T ₁ : Mulberry + Potato	135.77	10.30	112.58	444.73
T ₂ : Mulberry + Chilli	145.67	10.89	113.42	446.15
T ₃ : Mulberry + Brinjal	150.23	12.40	116.20	450.28
T ₄ : Mulberry + Tomato	141.40	12.55	116.02	446.33
T ₅ : Mulberry + Capsicum paprika	132.37	10.25	111.30	444.53
T ₆ : Mulberry + Pungent capsicum	125.30	9.91	107.34	438.27
T ₇ : Sole mulberry	159.43	13.31	121.81	470.50
Mean	141.45	11.37	114.10	448.69
S.Em±	3.31	0.84	2.66	9.88
C.D. at 5%	10.20	2.60	8.20	30.44

Number of leaves per plant

Significantly higher number of leaves per plant was recorded in sole mulberry (121.81) at 60 DAP which was on par with mulberry intercropped with brinjal and tomato. Similarly, significantly lowest number leaves were recorded in mulberry intercropped with pungent capsicum (107.34) which was on par with chilli (113.42), potato (112.58) and mulberry intercropped with capsicum paprika (111.30) (Table 1)

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Leaf yield per plant

The treatments differed significantly for mulberry leaf yield per plant, per plot, per ha per crop and per ha per 5 crops. The leaf yield was significantly superior in sole mulberry (470.50 g/plot, 30.11 kg/plot, 5.81 t/ha/crop and 29.04 t/ha/5 crops) compared to rest of the intercropping treatments. Among the intercropping treatments, mulberry in association with brinjal recorded significantly higher yield (450.28 g/plot, 28.82 kg/plot, 5.56 t/ha/crop and 27.80 t/ha/5 crops) and was on par with rest of the intercropped treatments except in association with pungent capsicum which recorded significantly lower mulberry leaf yield (438.20 g/plot, 28.05 kg/plot, 5.41 t/ha/crop and 27.05 t/ha/5 crops).

Growth and yield parameters of solonaceous intercrops

Number of fruits per plant

Among the different solonaceous intercrops in mulberry, chilli recorded significantly more number of fruits per plant (165.33) followed by tomato (58.44) and brinjal (22.17) but significantly higher compared to pungent capsicum (4.79), capsicum paprika (4.75) and potato (tubers) (4.39) where significantly least number of fruits were registered (Table 2)

Fruit yield (g/Plant)

Significantly higher fruit yield per plant was recorded in tomato intercropping (2027.50g) followed by brinjal (1917.33g) and chilli (1064.19g). Significantly least fruit yield was recorded in pungent capsicum (416.33g) as intercrop with mulberry. The fruit yield in respect of potato (645.50g/plant) and capsicum paprika (645.50 g/plant) were on par with each other (Table 2)

Economics of different intercrops in mulberry

Total cost of cultivation (INR./ha/crop)

Total cost of cultivation was more in mulberry + tomato intercropping system (INR. 2,52,000 /ha/crop) followed by Mulberry + potato (INR. 1,75,560 /ha/crop) followed by mulberry + brinjal (INR. 1,18,600 /ha/crop), mulberry + capsicum paprika, pungent capsicum (INR. 1,15,000 /ha/crop) While, it was least in mulberry + chilli intercropping (INR. 1,12,400 /ha/crop) (Table 3).

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Table 2: Fruit yield of different solonaceous vegetables intercropped in mulberry garden

Treatments	Number of fruits/plant	Fruit yield (g/plant)	Fruit yield plot ⁻¹ (kg)
T ₁ : Mulberry + Potato	4.39	645.50	72.86
T ₂ : Mulberry + Chilli	165.33	1064.19	119.00
T ₃ : Mulberry + Brinjal	22.17	1971.33	165.00
T ₄ : Mulberry + Tomato	58.44	2027.50	233.09
T ₅ : Mulberry + Capsicum paprika	4.79	645.50	72.86
T ₆ : Mulberry + Pungent capsicum	4.75	416.33	46.55
T ₇ : Sole mulberry	0.00	0.00	0.00
Mean	43.31	956.81	104.21
S.Em±	4.708	24.79	5.22
C.D. at 5%	14.506	76.37	16.08

Net returns (INR./ha/crop)

The net return earned was ranged from INR. 23,996/ha/crop to INR. 5, 81,996/ha/crop. Highest net returns of INR. 5, 81,996 ha/crop was obtained with intercropping of mulberry + tomato followed by mulberry + brinjal (INR. 3,85,396), mulberry + chilli (INR. 3,25,596), mulberry + capsicum paprika (INR. 1,76,996) and mulberry + potato (INR. 96,836). The least net returns of INR. 81,796 /ha/crop was recorded in mulberry + pungent capsicum intercropping system (Table 3).

Benefit Cost ratio

The higher B: C ratio of 3.61 was recorded in mulberry intercropped with brinjal which was on par with mulberry intercropped with chilli (3.30), tomato (3.07) and the lower B: C ratio of 1.47 was recorded in mulberry intercropped with potato followed by 1.54 in pungent capsicum (Table 3).

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Table 3: Economics of V-1 mulberry +solonaceous intercropping

Treatments	Gross returns (INR /ha)			Cost of cultivation (INR /ha)			Net Returns (INR /ha)	B:C ratio
	Amount of cocoon	Amount of intercrop	Total amount	Mulberry and rearing	Intercrop	Total		
T ₁ : Mulberry + Potato	52,558	2,48,400	3,00,958	28,562	1,75,560	2,04,122	96,836	1.47
T ₂ : Mulberry + Chilli	52,558	4,14,000	4,66,558	28,562	1,12,400	1,40,962	3,25,596	3.30
T ₃ : Mulberry + Brinjal	52,558	4,80,000	5,32,558	28,562	1,18,600	1,47,162	3,85,396	3.61
T ₄ : Mulberry + Tomato	52,558	8,10,000	8,62,558	28,562	2,52,000	2,80,562	5,81,996	3.07
T ₅ : Mulberry + Capsicum paprika	52,558	2,68,800	3,20,558	28,562	1,15,000	1,43,562	1,76,996	1.81
T ₆ : Mulberry + Pungent capsicum	52,558	1,72,800	2,25,535	28,562	1,15,000	1,43,562	81,796	1.56
T ₇ : Sole mulberry	52,558	-	52,558	28,562	-	28,562	23,996	1.84

Discussion

Effect of solonaceous intercropping on growth and yield of mulberry

Significantly higher leaf yield in sole mulberry (5.81 t/ha/crop) compared to rest of the intercropping treatments was mainly due to significant increase in the plant height (159.43 cm), number of branches per plant (13.31), number of leaves (121.81/plant), leaf area (373.38 dm²/plant), leaf area index (13.81) and leaf yield per plant (470.50g) compared to other intercropped treatments. This was also due to no competition from the intercrops for various inputs in sole mulberry. This might be due to non-significant influence of associated solonaceous intercrops (*viz.*, potato, chilli, brinjal, tomato, capsicum paprika and pungent capsicum). These results are in conformity with the findings of Shankar *et al.* (2006), Shankar *et al.* (1999), Dayakaryadav and Nagendra Kumar (1998), Ahsan *et al.* (1989), Kabir *et al.* (1991) and Hadimani (2003).

Among the solonaceous intercropping, mulberry + brinjal (5.56t/ha/crop) was recorded significantly higher mulberry leaf yield which was on par with other intercrops except mulberry + pungent capsicum.

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Significantly least mulberry leaf yield (5.41t/ha/crop) in association with pungent capsicum is due to variation in the varietal characters of pungent capsicum compared to other intercropped treatments.

Performance of solonaceous vegetables under mulberry intercropping system

Among the different solonaceous vegetables intercropped with mulberry, tomato (2027.50 g/plant) recorded significantly higher fruit yield compared to other treatments followed by brinjal (1971.33 g /plant) and chilli (1064.19 g/plant). This increase in fruit yield was mainly due to genetic characters of different vegetables. These results are corroborated with reports of Singh and Singh (2003), where the higher yield was positively correlated with fruit length, fruit weight and number of fruits per plant. These results are in line with Sawalgi (2002) who observed that Byadgikaddi and Arkalohit give better performance with respect to green chilli yield (348.14 g and 548 g, respectively).

Economics of intercrops grown in mulberry

Mulberry intercropped with tomato recorded significantly higher net returns (INR. 5, 81,996/ha/crops) and B: C ratio (3.07) which was on par with other intercropping system. The next best intercropping system was mulberry intercropped with brinjal (INR 3, 85,396 /ha/crop net returns with the highest B: C ratio of 3.61). It was due to better yield and market price for tomato and brinjal. These findings are in conformity with Ahsan *et al.* (1989), Kabir *et al.* (1991), Gargi *et al.* (1997), Dayakar Yadav and Nagendra Kumar (1998) and Shankar *et al.* (1999 or 2006) where in significantly higher net returns and B:C ratio were recorded in mulberry and legume intercropping system compared to sole mulberry.

Conclusion

Intercropping in mulberry helps in utilization of space between the mulberry plants, in turn it reduces the weed population, and there will be effective utilization of water by mulberry as well as the intercrop. Intercropping also helps to maintain soil health. During the failure of one crop *i.e.* mulberry other intercrops like solonaceous crops fetches income on the other hand.

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