

Effect of intercrops on yield of cabbage at different levels of fertilizers

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ABSTRACT

An intercropping in cabbage with palak, radish, onion and coriander was beneficial from the point of view of net profit per hectare. In intercropping palak is a crop, which can be harvested two times before 50 days and can give the highest yield as intercrop. There was reduction in yield of main crop, where no additional fertilizers were applied. However, no significant effect on yield of main crop was noted, when 1/3 additional dose of fertilizer was applied. More additional yield of main crop was obtained when 2/3 additional dose of fertilizer of respective intercrop was applied as compare to control (Sole crop cabbage). To find out suitable intercrop in cabbage four intercrops were studied *viz.*, onion, radish, palak and coriander with 1/3 and 2/3 additional fertilizer doses of respective intercrops and they were compared with sole cabbage crops as a control. The treatment cabbage + palak and application 2/3 additional dose of fertilizer of palak produced significantly higher cabbage monetary returns (Rs.53,026 ha⁻¹) and net profit (Rs.46,279 ha⁻¹), respectively. All the other intercrops treatments with or without additional fertilizer application also gave more gross and net profit as compared to sole crop cabbage as a control.

Key words : Intercropping, Cabbage, Onion, Radish, Palak and Coriander, Nutrient management

INTRODUCTION

In our country, area under vegetable crops is about 6.3 million ha and total production is 99.4 million tones per year (Economic Survey, 2005-2006), which is extremely low, to meet the demand of vegetarian and as well as non vegetarian people. During the last two to three decades there is rapid increase in the population, which increased the heavy demand for vegetable production because of greater applications of the food value of vegetables and of the place of vegetable in the nation's food requirement. The finding of research workers and their wider application in the field to increased the vegetable production have enhanced this interest to a great extent among growers and consumers.

In vegetables, cole crops like cabbage, cauliflower are well known and very popularly grown in different parts of India at the spacing of 45 to 60 cm in rows and 45 to 60 cm in plants. The duration of these crops are approximately 90 to 120 days. Therefore, the interspaces of such widely spaced crops can be better utilized by taking the intercrops of either short duration like radish, palak, coriander or having the straight growth like onion.

In Maharashtra and other states of India it is followed by taking short duration vegetables and cereals in long duration and widely spaced vegetables by so many cultivars since long time. But, very few workers have tried to standardize the intercropping of vegetables from research point of view for further recommendations. Patil (1988) reported that the intercropping of coriander in Brinjal gave highest net profit followed by radish in tomato and palak with chilli in the respective solanecious

vegetables. Gorkhe (1989) indicated that the intercropping of radish, onion and coriander was found highly profitable in cabbage crop. While attempting intercropping it is necessary to give additional doses of fertilizers for higher production and to avoid adverse effect of intercrops. Singh and Srivastava (1987) reported that although the cauliflower yield was highest in monoculture, however profitability per hectare was greatest when it was intercropped with spinach especially of the higher N level.

Therefore, it was felt necessary to standardize the intercropping of short duration vegetables like radish, palak, coriander and onion in cabbage with constant spacing and variable fertilizer doses to have satisfactory growth and production of main crop cabbage.

MATERIALS AND METHODS

The field experiment was conducted in Randomized Block Design with three replications during *Rabi* season of 1989-1990 at Department of Horticulture, Marathwada Agricultural University, Parbhani (MS). The soil of experimental plot was medium black, well drained with pH 8.1 and having organic carbon 0.07 per cent, total nitrogen 0.054 per cent, available P₂O₅ 0.004 per cent and available K₂O 0.042 per cent. Thirteen treatments consisted of T₁-Cabbage + Onion and no application of additional dose of fertilizers, T₂-Cabbage + Radish and no application of additional dose of fertilizers, T₃-Cabbage + Palak and no application of additional dose of fertilizers, T₄-Cabbage + Coriander and no application of additional dose of fertilizers, T₅-Cabbage + Onion and additional 1/3 recommended dose of onion, T₆-Cabbage + Radish and

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additional 1/3 recommended dose of radish, T₇-Cabbage + Palak and additional 1/3 recommended dose of Palak, T₈-Cabbage + Coriander and additional 1/3 recommended dose of Coriander, T₉-Cabbage + Onion and additional 2/3 recommended dose of onion, T₁₀-Cabbage + Radish and additional 2/3 recommended dose of radish, T₁₁-Cabbage + Palak and additional 2/3 recommended dose of palak, T₁₂-Cabbage + Coriander and additional 2/3 recommended dose of Coriander, T₁₃-Cabbage sole crop. The gross and net plot size was 4.2 x 3.6 m² and 3.0 x 2.4 m², respectively. Pride of India variety of cabbage as a main crop was used. The varieties N-53 (Onion), Japanese White (Radish), Pusa All Green (Palak) and Local (Coriander) were used.

The crop was planted by adapting ridges and furrows opened at 60 cm spacing. Cabbage seedlings were transplanted on the 1/3 height of ridges to north side by keeping 60 cm spacing in between two seedlings as well as sowing of intercrops and transplanting of onion was done on the other side (south) by keeping 10 cm spacing in between two plants. The recommended dose of fertilizers *i.e.* NPK of Cabbage (160:80:80 kg ha⁻¹), Onion (100:50:50 kg ha⁻¹), Radish (100:50:50 kg ha⁻¹) Palak (100:50:50 kg ha⁻¹) and coriander (50:50:50 kg ha⁻¹) were applied through Urea, Single Super Phosphate, Murate of Potash. Half dose of nitrogen and full dose of phosphorus and potash of cabbage was applied before transplanting to all plots. Similarly, 1/3 and 2/3 doses of fertilizers of the respective intercrops were applied in the randomly distributed plots as per treatments before transplanting. Remaining dose of nitrogen was applied after 30 days of transplanting to cabbage crop.

Harvesting of cabbage was followed when the firm and compact head were observed. The harvesting of onion was done when the bulbs were ready for harvesting after falling the leaves. The harvesting of radish was followed when it was developed but was not spongy and fibrous. Harvesting of leafy vegetables like palak and coriander was done before the flowering.

The statistical analysis was done by using analysis of variance technique as suggested by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

Yield of cabbage :

The data presented in Table 1 revealed that the yield of cabbage per hectare was significantly not different from the treatment were 1/3 or 2/3 dose of additional fertilizers was applied to the respective intercrops (T₅ to T₁₂) and sole crop (T₁₃). However, the additional yield of main crop was obtained in the treatment where 2/3 additional dose was applied irrespective of any intercrops and yield in decreasing trend was observed where 1/3 additional dose was applied. Significantly lower yields were noted where no additional fertilizers were applied except in treatment T₂ as compares to sole crop. It means due to more dose of fertilizers applications more growth was obtained by which the yield in these treatment might have increased. Similar type of observations was also

Table 1 : Yield of cabbage and intercrops as influenced by different treatments of intercropping and fertilizers doses

Treatments	Intercrops	Yield of cabbage (q ha ⁻¹)	Cabbage yield increase /decrease (q ha ⁻¹)	Yield of intercrops (q ha ⁻¹)
T ₁	Onion + no additional fertilizer	254.44	-15.56	65.41
T ₂	Radish + no additional fertilizer	259.16	-10.84	78.75
T ₃	Palak + no additional fertilizer	257.63	-12.37	106.66
T ₄	Coriander + no additional fertilizer	255.55	-14.45	7.08
T ₅	Onion + 1/3 additional dose of onion	264.58	- 5.42	67.91
T ₆	Radish + 1/3 additional dose of radish	270.27	+0.27	80.83
T ₇	Palak + 1/3 additional dose of palak	268.33	- 1.67	110.00
T ₈	Coriander + 1/3 additional dose of coriander	266.11	-3.89	7.63
T ₉	Onion + 2/3 addition dose of onion	272.50	+ 2.50	72.22
T ₁₀	Radish + 2/3 addition dose of radish	279.16	+ 9.16	82.63
T ₁₁	Palak + 2/3 addition dose of palak	276.38	+ 6.38	115.69
T ₁₂	Coriander + 2/3 addition dose of coriander	274.02	+ 4.02	8.05
T ₁₃	Control (Sole crop cabbage)	270.00	-	-
S.E.±		3.97	-	1.39
C.D. (P=0.05)		11.60	-	4.08

noted by Randhawa and Sharma (1973).

As regards intercrops, the intercrop radish gave an additional yield of 9.16 q and 0.27 q per hectare where 2/3 and 1/3 additional fertilizers of radish crop were applied over control (sole crop). The yield due to intercrop of radish without additional dose of fertilizer application was also significantly not different from the yield of sole crop. An additional yield was also gained due to intercrops palak (6.38), coriander (4.02) and onion (2.50) with 2/3 additional dose of fertilization application of the respective intercrops. The lowest yield was noted in the treatment where onion was taken as an intercrop without application of additional fertilizer. This may be due to more duration of onion crop.

The above observations indicate that there was no effect of radish as an intercrop in any condition where as no effect of any intercrop on the yield of main crop when additional doses of fertilizers were applied. It means in cabbage short duration intercrops can be taken successfully. Patil (1988) studied the intercrops of radish, palak, coriander, and onion in solanecious crop. He found that, there was no effect of intercrop on the yield of main crop except coriander.

Yield of intercrops :

The data presented in Table 1 revealed that there were significant differences in the yield of intercrops due to various treatments. The yield of palak was significantly more when 2/3 additional doses of fertilizers were applied followed by the palak yield with 1/3 additional dose and palak with no additional dose was given. These three treatments were significantly superior over other intercrops with or without application of fertilizers. The next best intercrops were radish, onion and coriander in sequence. They were also significantly different from each other as the fertilizer dose was increased, there was increase in yield of respective intercrop. The higher yield in palak was due to double harvesting. It is also true that there is a variation in yields of two different type of crop.

Economics :

Gross return of main crop and intercrop :

The data presented in Table 2 revealed that the gross return from treatment T₁₀ was more which was statistically similar with gross return obtained from the treatments where 1/3 or 2/3 additional fertilizers of respective crop were applied and control except T₅. The gross return was higher in the treatments where 2/3 additional dose of fertilizer of respective intercrop was applied and lower in the treatments where 1/3 dose was applied and no additional dose was applied as compared

Table 2 : Gross returns from main crop and intercrops in rupees as influenced by different treatments of intercropping and fertilizer doses

Treatments	Cross returns from Main crop Cabbage (Rs ha ⁻¹)	Gross returns from intercrops (Rs.ha ⁻¹)
T ₁	38166.00	6541.00
T ₂	38874.00	7875.00
T ₃	38644.50	10666.00
T ₄	38332.50	3540.00
T ₅	39687.00	6791.00
T ₆	40540.50	8083.00
T ₇	40249.50	11000.00
T ₈	39916.50	3815.00
T ₉	40875.00	7222.00
T ₁₀	41874.00	8263.00
T ₁₁	41457.00	11569.00
T ₁₂	41103.00	4025.00
T ₁₃	40500.00	-
S.E. ±	594.20	141.95
C.D. (P= 0.05)	1734.40	416.35

to control. It was due to more yield of cabbage obtained in the respective treatment.

While studying the data presented in Table 2 it is clear that the gross return gained from the palak as an intercrop were significantly more in T₁₁. The gross return obtained from palak of T₇ and T₃ were statistically similar and significantly more than other treatments. The gross return obtained in the various intercrops were in increasing trend where fertilizer doses were applied. The sequence of gross return from other intercrops were radish, onion and coriander. This variation was due to different yields obtained in different intercrops. The increase in gross return from intercrops by application of higher doses was due to more growth and yield recorded by various treatments. Similar types of results were also noted by Patil (1988) and Gorkhe (1989).

Gross profit and net profit in rupees :

The data presented in Table 3 revealed that the treatment T₁₁ (cabbage + palak with 2/3 additional dose of fertilizer of palak) gave highest gross and net profit per hectare of Rs.53,026/- and Rs. 46,2797/-, respectively. Similarly, gross profit obtained due to palak intercrop with or without additional fertilizer application was more as compared to all other treatments. Infact all the intercrops with or without additional fertilizer application recorded more gross and net profit as compared to control. But, due to additional fertilizer application more gross and net profit from intercropping of palak, radish, onion and coriander were gained in sequence. The additional income

Table 3 : Gross profit and net profit in rupees as influenced by different treatments of intercropping fertilizer doses

Treatments	Gross profit (Rs ha ⁻¹)	Net profit in (Rs ha ⁻¹)
T ₁	44707.00	38138.00
T ₂	46749.00	40405.00
T ₃	49310.50	42950.50
T ₄	41872.50	35602.50
T ₅	46478.00	39771.00
T ₆	48623.50	42141.50
T ₇	51249.50	44751.50
T ₈	43731.50	37361.50
T ₉	48097.00	41141.00
T ₁₀	50137.00	43406.00
T ₁₁	53026.00	46279.00
T ₁₂	45128.00	38720.00
T ₁₃	40500.00	34626.00
SE ±	635.62	635.69
C.D. (P=0.05)	1855.30	1855.50

per hectare from intercropping of coriander, radish, onion and palak was more in solanecious crops was reported by Patil (1988). Gorkhe (1989) observed that intercropping of radish, onion and coriander was highly profitable in cabbage crop and gave an additional income Rs. 6,448/-,

Rs. 6,250/- and Rs. 5,679/-, respectively with slight reduction in cabbage yield.

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Received : August, 2009; Accepted : December, 2009