



COMPANION CROPPING OF CABBAGE AND RADISH WITH TOMATO FOR ENHANCING PRODUCTIVITY OF VEGETABLE

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ABSTRACT

The trial on companion cropping was laid out on farmers' fields in autumn season of 2016-17 at Kannauj district under situation base study. The pilot project situated in the catchments area of *Kali* river, having sandy loam soil with poor soil fertility status. Three cropping systems i.e. tomato alone, tomato + cabbage and tomato + radish were tested. The higher yield of pure tomato was plucked by 655.20 q/ha. Tomato + radish companion cropping gave fruits yield of tomato by 628.00 q/ha. The lowest yield was harvested by 601.50 q/ha under tomato+cabbage companion cropping system. The cabbage heads were harvested by 215.80 q/ha, while fresh roots of radish uprooted by 76.70 q/ha. The growth and yield traits of tomato were concordance to the yield. The maximum net return computed under tomato+cabbage by Rs 154108/ha and BCR 1:2.70 followed by net return of Rs 124478/ha and BCR 1:2.43 under tomato+radish. The lowest net return and BCR were found under pure cropping of tomato.

KEYWORDS: Companion cropping, Farming situation, Pilot project, Situation specific, Smart agronomy.

INTRODUCTION

With fast increasing demography, unemployment, sinking land and water resources and adverse effects of climate change has pushed up for generation of new technology under vegetable production. Intercropping is the only system to face above problems. Tomato is one of the most widely grown vegetable crop in India. It is grown across the country as a common vegetable in farm garden, home garden, market garden for fresh consumption and for processing purposes. Similarly, cabbage is common vegetable crop available during winter season throughout India. Cabbage thrives best in a relatively cool moist climate. It can withstand extreme cold and frost relatively better to cauliflower. Cabbage can be grown on all type of soil from light to heavy soils. Likewise, radish is one of the common root crop grown all over India. It is grown widely in northern and southern plain as well as in the hills. It is consumed almost in every house whether rich or poor. It is eaten both raw as salad or cooked in various ways. Therefore, these three vegetable crops grown almost same time in winter season on same soil type and irrigational requirement. Radish a quick growing crop, it is easily planted as a companion crop or associate crop between the rows of other vegetables. It is also planted on mounds or ridges, separating one plot from another. It is mostly cultivated near the city markets. Since the cabbage heads are not attain much height, can also be intercropped as filler crop with forest trees and fruit trees. In vegetables it can also be grown as companion crop with coriander and aniseed etc. The companion cropping of cabbage and radish with tomato is the subject matter of this text.

MATERIALS AND METHODS

The situation specific study was undertaken during winter season of 2016-2017 on farmers' fields of Kannauj district.

The pilot project area is situated in riverine tract of Central Plain Zone of UP in catchments area of river *Kali*. The main objective of study was to harvest the higher yield of vegetable, more net return and desired recovery concrete. The secondary objective was to increase the financial status of small and marginal land holders. The pilot project area site was sandy loam, having pH 8.0, organic carbon 0.26%, total nitrogen 0.02%, available P_2O_5 10.00 kg/ha and available K_2O 273 kg/ha, therefore, the fertility status of pilot area was low. The pH was determined by Electrometric glass electrode method (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta, *et al.* 1962). Total nitrogen was analysed by Kjeldahl's method as discussed by Piper (1950). The available P_2O_5 and K_2O were determined by Olsen's method (Olsen *et al.*, 1954) and Flame photometric method (Singh, 1971). The farming situation of the area was irrigated. The main problem of the vegetable growing area is low fruits yield of alone tomato, which provided low income to the farmers. The adoptive trial on intercropping was undertaken on 15 farmers' fields and compared the fruits yield of tomato with intercropping system of tomato+cabbage and tomato+radish. Three cropping systems i.e., tomato alone, tomato+cabbage and tomato+radish were tested. Tomato was transplanted on ridges under ridge and furrow method at spacing of 50 cm apart. In vacant space of 50 cm between two rows of tomato, one row of cabbage seedling was transplanted. Similarly, in tomato+radish intercropping system one row of radish was sown in vacant space of two rows of tomato. Tomato cultivar *Namdhari-585* was planted in mid October and at the same time cabbage and radish planted as intercrops. The mature fruits of tomato were plucked upto 148 days. The head of cabbage harvesting was started from 60 days and continued upto 75 days of

transplanting, when they attained full size. At tender stage radish roots uprooted and crisped. All the radish roots were not uprooted from the whole field at one time but they become big enough for the market or home consumption. Therefore, uprooting was started from 45 days of seeding and continued till 60 days of seeding. The smart agronomical practices were followed. The irrigations were given as and when required.

RESULTS AND DISCUSSION

The average data of farmers fields were recorded and reported in Table 1&2 and discussed hereunder appropriate heads.

Growth parameter of tomato

The highest plant stand by 28702/ha was recorded under alone planting of tomato. The plant stand under both intercropping system was recorded at par, but low in comparison to sole plant stand of tomato. This was due to smothering effect of companion crops of cabbage and radish on plant stand of tomato (Table 1).

Yield contributing parameters of tomato

The maximum number of fruits/plant was recorded in pure crop of tomato by 50.60/plant, closely followed by tomato+radish intercropping treatment (49.30/plant). In tomato+cabbage intercropping system, fruits of tomato was counted 48.70/plant, which was lowest. The similar trend was also recorded in fruits weight/plant. The individual fruit weight of tomato weighed higher in alone cropping of tomato by 49.7 g/fruit, closely followed by 49.2g/fruit under tomato+radish. The lowest fruit weight by 48.6g/fruit weighed in cropping system of tomato+cabbage. The shade effect of broad leaves of cabbage reduced the individual weight of tomato fruit.

Yield of tomato

The higher yield of 655.20 q/ha was weighed in sole cropping of tomato. Tomato+radish system produced fruits by 628.00 q/ha, while minimum yield of 601.50 q/ha was noted under tomato+cabbage treatment. The considerable improvement in fruits/plant, fruits weight/plant, individual fruit weight was recorded in pure tomato, supported to the higher fruits yield. The reduction in yield contributing traits under tomato+cabbage and tomato+radish was responsible for the lowest yield of tomato fruits.

Yield of intercrops

The cabbage heads was harvested by 215.80 q/ha, while fresh roots of radish weighed by 76.70 q/ha, which were additional produce.

Economic study of systems

The cost of cultivation of Rs 82032/ha, Rs91082/ha and Rs 86932/ha were calculated under sole cropping of tomato, tomato + cabbage and tomato + radish, respectively. Gross return was calculated by Rs 196560/ha in pure cropping of tomato, Rs 245190/ha in tomato+cabbage and Rs 211410/ha in tomato + radish. The highest net return and BCR were obtained by Rs154108/ha and 1:2.70 under tomato+cabbage followed by Rs 124478/ha and 1:2.43 under tomato+radish. The lowest net return by Rs 114528/ha and BCR 1:2.39 were calculated under pure cropping of tomato. The additional yield of intercropping was responsible for higher net profit in tomato+cabbage and tomato+radish (Table 2). These results are in agreement with those reported by Singh (2006), Singh (2008), Singh *et al.* (2017) and Singh *et al.* (2018).

TABLE 1: Growth, yield traits and yields of vegetables under different treatments

Treatment	Plant population Tomato/ intercrop	Fruits/ plant	Fruit Wt./ plant (kg)	Fruit weight (g)	Tomato yield (q/ha)	Yield of intercrops (q/ha)
Sole planting of tomato	28702	50.6	2.56	49.7	655.2	-
Planting of tomato + cabbage (2:1)	28499/ 19918	48.7	2.43	48.6	601.5	215.8
Planting of tomato + radish (2:1)	28496/ 62310	49.3	2.51	49.2	628.0	76.7

TABLE 2: Economics under different cropping systems

Treatment	Tomato equivalent yield (q/ha)	% age increase	Gross Cost (Rs/ha)	Gross Returns (Rs/ha)	Net Return (Rs/ha)	Additional income (Rs/ha)	B:C Ratio
Sole planting of tomato	655.2	-	82032	196560	114528	-	2.39
Planting of tomato + cabbage (2:1)	817.3	17.2	91082	245190	154108	38580	2.70
Planting of tomato + radish (2:1)	704.7	4.2	86932	211410	124478	9950	2.43

Market price of tomato Rs 300.00/q, cabbage Rs 300/q and radish Rs 300/q.

CONCLUSION

The farmers residing in the vicinity of city and follow the vegetable cultivation on small holding may be advocated for adoption of tomato + cabbage and tomato + radish companion cropping.

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