

## YIELD AND ECONOMICS OF SWEET CORN-BASED CROPPING SYSTEMS IN RAINFED CONDITION

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### ABSTRACT

*A field experiment was conducted during Kharif season of 2009 at Akola to study the impact of sweet corn and vegetable intercropping system on growth and yield in rainfed condition. The experiment was laid out in randomized block design with four replications and six treatments. These six treatments comprised of sweet corn as a base crop and fenugreek, spinach, coriander, garlic and shepu as intercrops. The sole sweet corn and sweet corn + shepu significantly increased the plant height, functional leaves and leaf area as well as yield contributing characters viz., length of cob and grains per cob over other vegetables intercropping treatments. The grain and fodder yield was also increased with sole sweet corn and sweet corn + shepu over the other treatments. The green cob yield was also recorded higher with sole sweet corn. The lower values of all these parameters were recorded in Sweet corn + spinach intercrop. The highest gross return ( $\text{₹} 483687.47 \text{ ha}^{-1}$ ), net return ( $\text{₹} 419973.10 \text{ ha}^{-1}$ ) and B/C ratio (6.83) were recorded with sweet corn + coriander inter crop.*

**Keywords:** Sweet corn, intercropping system, growth and yield

### INTRODUCTION

Sweet corn is one of the most popular crop for human consumption among different types of corn grown. Sweet corn has been bred to have higher levels of natural sugar, which makes it very popular. It is hybridized maize, specially bred to increase sugar content and also known as "Sugar corn". Vegetable as a intercrop provides leafy vegetable under rainfed situation within short duration which gives more monetary returns than any other short duration agronomical crop as demand of vegetables during the rainy season is more. Fenugreek commonly known as methi is cultivated throughout India which is used for cooking, salad and fodder purpose. Spinach is one of the most common vegetables of tropical and subtropical region and is grown widely in India. Leaves are rich in vitamin A, C, calcium, etc. Coriander is used as common flavouring substance. Its leaves are used for flavouring curries, sauces and soups. Garlic leaves are rich in proteins, phosphorus, potassium, calcium, magnesium, carbohydrates and used for cooking purpose. Shepu leaves are easily available in most part of India throughout the year and are added to favour many recipes. Intercropping is much more scientific, rational and refined concept than traditional practice of mixed cropping. Although intercropping is not now new concept it has attracted worldwide attention due to its various advantages. It was originally practiced as an insurance against crop failure under rainfed conditions. At present its main objective is higher productivity per unit area in

addition to stability in production in Rainfed situation where uncertainly and ill distribution of rainfall, monocropping becomes risky. Preliminary studies show that intercropping system is used for additional yield increment of corn in rainfed areas of Maharashtra. Therefore an experiment was planned as to study the effect of different vegetables intercrops on growth, yield and economics of sweet corn and vegetable intercropping systems.

### MATERIALS AND METHODS

The present experiment was conducted at Agronomy farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Akola is situated in subtropical zone at the latitude of  $22^{\circ}41'$  N and longitude of  $77^{\circ}22'$ . The altitude of this place is 307.41 m above mean sea level. The climate of the place is semi-arid and characterized by three districts season viz., hot and dry summer from March to May, warm and rainy monsoon from June to October and mild winter from November to February. Rains are mostly received from south west monsoon during June to October. The normal rainfall of Akola is 750 mm which is received in 35 to 40 rainy days during a period from June to September. The winter rains are scanty and unpredictable. The investigation was conducted in randomized block design with six treatments viz, T<sub>1</sub>- sole sweet corn, T<sub>2</sub>- sweet corn + Fenugreek, T<sub>3</sub>- sweet corn + spinach, T<sub>4</sub>- sweet corn + coriander, T<sub>5</sub>- sweet corn + garlic and T<sub>6</sub>- sweet corn + shepu and four replications. The topography of the experimental plot was fairly uniform and levelled with 2 per cent grade. Soil of the experimental site was clayey in

texture, slightly alkaline in nature (pH 7.87) having moderate organic carbon content ( $4.2 \text{ g kg}^{-1}$ ), low available nitrogen ( $196 \text{ kg ha}^{-1}$ ), low available phosphorus ( $19 \text{ kg ha}^{-1}$ ) and high available potassium ( $320 \text{ kg ha}^{-1}$ ).

In sweet corn and other vegetables crops like fenugreek, spinach, coriander and shepu were sown by dibbling and line sowing method on dated 3 July 2009. In sweet corn, the fertilizers were applied as per recommended dose i.e. 120:60:60 N,  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O}$   $\text{ha}^{-1}$ . Nitrogen was applied in three split doses and full dose of  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O}$  were applied at the time of sowing. The fertilizers were applied by placing them in the side of each row and covering them with soil, through hoeing immediately. In vegetable crops, the fertilizers were applied as per RDF i.e in fenugreek,

spinach and coriander 50:00:00 NPK  $\text{kg ha}^{-1}$ , in garlic 50:25:25 NPK  $\text{kg ha}^{-1}$  and in shepu 50:25:00 NPK  $\text{kg ha}^{-1}$ . Full dose of nitrogen,  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O}$  were applied at the time of sowing as basal dose. Growth characters, yield attributes and yields were recorded at physiological maturity. Economics was worked out on the basis of the prevailing market rate of inputs and produce.

## RESULTS AND DISCUSSION

Data (Table 1) indicated that the sole sweet corn recorded significantly maximum plant height (178.36 cm), functional leaves (23.57) and leaf area per plant (77.85) over sweet corn + spinach and it was at par with sweet corn + fenugreek, sweet corn + coriander, sweet corn + garlic and sweet corn + shepu.

Table 1: Growth of sweet corn as influenced by different intercrop

| Treatment                               | Plant Height (cm) | Functional leaves/plant | Leaf area/plant |
|-----------------------------------------|-------------------|-------------------------|-----------------|
| T <sub>1</sub> -Sole sweet corn         | 178.36            | 23.57                   | 77.85           |
| T <sub>2</sub> - sweet corn +fenugreek  | 172.62            | 21.47                   | 75.99           |
| T <sub>3</sub> - sweet corn + spinach   | 160.30            | 16.87                   | 65.11           |
| T <sub>4</sub> - sweet corn + coriander | 174.05            | 18.89                   | 74.30           |
| T <sub>5</sub> - sweet corn + garlic    | 175.55            | 21.52                   | 72.57           |
| T <sub>6</sub> - sweet corn + shepu     | 176.8             | 21.32                   | 75.52           |
| SE(m) $\pm$                             | 3.65              | 0.37                    | 2.59            |
| CD (P=0.05)                             | 10.99             | 1.12                    | 7.80            |

This indicated that adequate space available due to these treatments during the growth period enhanced plant height, which ultimately resulted in increase of nodes and internode with increase in functional leaves and leaf area per plant. Similar results were reported by Jha and Singh (2000) and Anup Das (2002). Data (Table 2) revealed that days to 50% tasseling and silking were not significantly influenced due to

different treatments. Length and girth of cob, grains  $\text{cob}^{-1}$  and test weight were influenced by different treatments, sole sweet corn significantly increased the length of cob (21.95 cm), girth of cob (9.56 cm), grains  $\text{cob}^{-1}$  (567.75) and test weight (129.70 gm) over most of the treatments. The lowest values of these parameters were recorded under sweet corn + coriander.

Table 2: Post harvest studies of sweet corn as influenced by different intercrop

| Treatment                               | Days to 50% tasseling and silking | Length of cob (cm) | Girth of cob (cm) | Grains/cob | Test wt. (g) |
|-----------------------------------------|-----------------------------------|--------------------|-------------------|------------|--------------|
| T <sub>1</sub> -Sole sweet corn         | 38.7                              | 21.95              | 9.56              | 567.7      | 129.70       |
| T <sub>2</sub> - sweet corn +fenugreek  | 40.7                              | 20.34              | 8.37              | 528.1      | 115.37       |
| T <sub>3</sub> - sweet corn + spinach   | 40.5                              | 16.48              | 7.76              | 523.3      | 109.80       |
| T <sub>4</sub> - sweet corn + coriander | 40.0                              | 19.38              | 9.08              | 550.7      | 117.67       |
| T <sub>5</sub> - sweet corn + garlic    | 39.7                              | 20.51              | 9.12              | 551.7      | 120.6        |
| T <sub>6</sub> - sweet corn + shepu     | 39.2                              | 21.75              | 9.22              | 560.2      | 128.66       |
| SE(m) $\pm$                             | 0.99                              | 1.16               | 0.37              | 7.73       | 4.25         |
| CD (P=0.05)                             | NS                                | 3.50               | 1.13              | 23.30      | 12.82        |

Data pertaining to dried grain and fodder yield as influenced by different intercrops are presented in Table 3. It indicated that treatment sole sweet corn recorded significantly higher green cob yield ( $356.27 \text{ q ha}^{-1}$ ), grain yield ( $96.61 \text{ q ha}^{-1}$ ), fodder

yield ( $250.59 \text{ q ha}^{-1}$ ) and biological yield ( $403.86 \text{ q ha}^{-1}$ ) over treatments sweet corn + spinach. But it was at par with sweet corn + fenugreek, sweet corn + coriander, sweet corn + garlic and sweet corn + shepu intercrops. Harvest index and grain to fodder ratio

were not affected significantly due to different intercrops. The sole sweet corn recorded significantly higher green cob yield, dried grain yield and fodder yield than any intercropping treatments. The yield reduction in intercropping treatment was due to competition for nutrient, moisture, space, etc. These

results were in agreement with those reported by Menon and Mallik (1980), Kulkarni (1995), Krishnaswamy *et al.* (1995), Anup Das (2002) as they found reduction in yield of base crop due to intercrop competition.

Table 3: Yield parameters of sweet corn as influenced by different intercrops

| Treatment                               | Green cob yield (qha <sup>-1</sup> ) | Grain yield (qha <sup>-1</sup> ) | Fodder yield (qha <sup>-1</sup> ) | Biological yield (qha <sup>-1</sup> ) | Harvest index (%) | Grain to fodder ratio |
|-----------------------------------------|--------------------------------------|----------------------------------|-----------------------------------|---------------------------------------|-------------------|-----------------------|
| T <sub>1</sub> -Sole sweet corn         | 356.27                               | 96.61                            | 250.59                            | 403.86                                | 23.93             | 0.38                  |
| T <sub>2</sub> - sweet corn +fenugreek  | 353.67                               | 93.26                            | 245.60                            | 391.98                                | 23.81             | 0.37                  |
| T <sub>3</sub> - sweet corn + spinach   | 252.10                               | 58.87                            | 158.51                            | 245.92                                | 24.02             | 0.37                  |
| T <sub>4</sub> - sweet corn + coriander | 354.81                               | 96.05                            | 250.15                            | 401.27                                | 23.93             | 0.38                  |
| T <sub>5</sub> - sweet corn + garlic    | 355.25                               | 96.11                            | 250.28                            | 401.55                                | 23.97             | 0.38                  |
| T <sub>6</sub> - sweet corn + shepu     | 355.67                               | 96.25                            | 250.39                            | 402.03                                | 23.92             | 0.38                  |
| SE(m) <sub>±</sub>                      | 16.86                                | 4.31                             | 9.89                              | 15.84                                 | 1.69              | 0.01                  |
| CD (P=0.05)                             | 50.81                                | 13.00                            | 29.82                             | 47.74                                 | NS                | NS                    |

Data regarding the gross returns, net monetary returns and benefit cost ratio are presented in Table 4. The economic analysis of the investigation reveals that the highest gross monetary returns (₹. 483687.47 ha<sup>-1</sup>), net monetary returns (₹. 419973.10

ha<sup>-1</sup>) and benefit cost ratio (6.83) were observed with treatment sweet corn + coriander followed by sweet corn + spinach. The minimum net return and B:C ratio were recorded under sole sweet corn.

Table 4: Economics of sweet corn as influenced by different intercrop

| Treatment                               | GMR (₹. ha <sup>-1</sup> ) | NMR (₹. ha <sup>-1</sup> ) | B:Cratio |
|-----------------------------------------|----------------------------|----------------------------|----------|
| T <sub>1</sub> -Sole sweet corn         | 98857.45                   | 56622.30                   | 2.37     |
| T <sub>2</sub> - sweet corn +fenugreek  | 217915.30                  | 152335.73                  | 3.91     |
| T <sub>3</sub> - sweet corn + spinach   | 422629.11                  | 356908.61                  | 6.43     |
| T <sub>4</sub> - sweet corn + coriander | 483687.47                  | 419973.10                  | 6.83     |
| T <sub>5</sub> - sweet corn + garlic    | 149949.63                  | 74827.75                   | 2.29     |
| T <sub>6</sub> - sweet corn + shepu     | 294024.93                  | 286469.12                  | 4.49     |

From the study, it is concluded that the growth and yield attributes were significantly higher with sole sweet corn than other intercrops Sweet corn

+ coriander recorded highest GMR, NMR and B:C ratio followed by treatments sweet corn + spinach and sole sweet corn.

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