**Response of Sweet Corn to Intercropping and Fertility Level**

**ABSTRACT**

**Aims:** The field experiment was conducted to study the effect of intercropping and fertility level on yield and economics of sweet corn.

**Study design:** Split plot design having three main plots and five sub plots with three replications.

**Place and duration of study:** Department of Agronomy, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha during rabi season of 2022-23.

**Methodology:** The experiment was conducted with three main plots consisting of sole sweet corn, sweet corn + radish and sweet corn + beans and five sub plots viz. five fertility levels such as 0:0:0, 40:20:20, 80:40:40, 120:60:60 and 160:80:80 kg N:P2O5:K2O ha-1. Observations were taken on plant growth, yield attributing factors, yield and economics.

**Results:** Competition due to presence of intercrops lead to reduced growth and yield of sweet corn. The highest green cob yield of 10.07 t ha-1 was obtained from sole sweet corn, which was statistically superior over yield obtained from sweet corn taken with intercrops. Optimum yield of green cob (10.61 t ha-1) was recorded with application of 120 kg N, 60 kg P2O5 and 60 kg K2O ha-1. Maximum green cob equivalent yield (12.66 t ha-1) was obtained in sweet corn + radish intercropping system. In case of fertility levels, green cob equivalent yield attained the optimum value (14.32 t ha-1) with application of 120 kg N, 60 kg P2O5 and 60 kg K2O per hectare. Maximum net profit of ₹ 111.3 thousand per hectare was obtained when radish was intercropped with sweet corn.

**Conclusion:** Application of 120 kg N, 60 kg P2O5 and 60 kg K2O per hectare to sweet corn and intercropping with radish is suitable to obtain optimum yield of sweet corn, green cob equivalent yield and net profit.

*Keywords: Sweet corn, intercropping, fertility level, yield, economics*

**INTRODUCTION**

Sweet corn (*Zea mays var. saccharata*) is one type of maize with higher sugar content, which is cultivated for human consumption. It has gained wide popularity, both in urban and rural areas due to its sweetness and pleasant taste. Being a widely spaced crop, it provides ample of opportunity to grow various intercrops in the inter-row spaces without affecting the plant population of main crop. Suitable intercrops not only enhance profit of the farmers, but also improve the soil fertility. Both field crops and vegetables can be rightfully taken as intercrop along with sweet corn. Among vegetable crops, radish and beans can be appropriately intercropped with sweet corn as these are short duration crops with higher economic yields and result in higher economic return. Radish can be comfortably grown in the inter space of sweet corn, as it has less canopy and no shading effect. Being a pulse crop, beans intercropped with sweet corn offers double benefit of profit enhancement and soil health improvement. Latati *et al.* (2013) reported that bean had a positive effect on inter-specific competition through nitrogen partitioning with the intercropped maize due to increase in nitrogen fixation. Proper nutrient management is crucial to ensure healthy plant, high yield and obtain good quality sweet corn. Adequate supply of plant nutrients accelerates physiological activity of the plant resulting in higher dry matter accumulation and more yield. Sahoo and Mohanty (2020) opined that fertilizer management can be optimally decided to obtain profitable yield of sweet corn. With this backdrop, it was felt necessary to determine appropriate intercrops for sweet corn and suitable levels of fertility to obtain maximum yield and net profit.

**MATERIALS AND METHODS**

A field experiment was conducted at Agronomy Main Research Farm, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar under East and South Eastern Coastal Plain Agro-climatic Zone of Odisha. The experiment was carried out during rabi season of 2022-23 under irrigated situation to study the response of sweet corn based intercropping to levels of fertility. The soil of the experimental field was well drained, sandy loam with pH value of 5.71. The status of available nitrogen, phosphorus and potassium was medium. The experiment was conducted in the statistical design of split plot having three main plots (sole sweet corn, sweet corn + radish and sweet corn + beans) and five sub plots consisting of five fertility levels such as 0:0:0, 40:20:20, 80:40:40, 120:60:60 and 160:80:80 kg N:P2O5:K2O ha-1 with three replications. The seeds of sweet corn hybrid Sugar 75, radish variety Palak Patta-71 and beans variety Poorva were sown on 27th October 2022.The spacing of sweet corn was 60 cm x 25 cm, whereas radish and beans were sown at a plant to plant spacing of 15 cm in the inter-rows of sweet corn without affecting the population of main crop.

**RESULTS AND DISCUSSION**

Growth of sweet corn was adversely affected due to presence of intercrops because of competition for solar radiation, water and nutrients. Sole crop of sweet corn resulted in better plant growth in absence of competition for sunlight, plant nutrients and water, which has reflected in higher yield and yield attributing characters. The highest weight of green cob with husk (235.1 g) was obtained in sole crop of sweet corn, which was 5.5 % and 14.9 % more than sweet corn intercropped with radish and beans, respectively. Earlier, Vidhyashree *et al.* (2019) obtained 50.5 per cent higher yield of fresh cob from sole sweet corn than sweet corn + fenugreek intercropping system. The maximum of 314.4 kernels per cob was recorded in sole sweet corn, which was 6.4 per cent more than the kernels obtained from sweet corn intercropped with beans (Table 1) due to less competition in the sole maize crop in absence of intercrop. Hossain *et al*. (2015) also observed that number of kernels per cob was higher in sole maize crop than intercropping treatments.

The highest green cob yield of 10.07 t ha-1 was obtained from the sole sweet corn, which was statistically superior over the yield obtained from sweet corn in intercropping treatments. There was reduction of green cob yield by 24.0 and 30.3 per cent when sweet corn was intercropped with radish and beans, respectively. Vidhyashree *et al.* (2019) also reported 50.5 per cent higher yield of fresh cob from sole sweet corn than sweet corn + fenugreek intercropping system. Similarly, Samsuri *et al.* (2022) obtained higher yield from sole sweet corn crop than its intercropping. Additional production of intercrops contributed to higher value of green cob equivalent yield from the intercropping system. Maximum green cob equivalent yield of 12.66 tonne per hectare was recorded in sweet corn + radish intercropping system, which was 25.7 per cent higher than sole sweet corn (Table 2). Maximum green fodder yield of 31.19 t ha-1 was recorded in sole sweet corn crop. Slow down of vegetative growth of sweet corn due to presence of intercrops like radish and beans reduced the green fodder yield of sweet con by 12.9 and 21.2 per cent, respectively when compared with sole crop. Cost of cultivation is a crucial factor for selection of intercrops as mentioned by Banik and Sharma (2009). In the present experiment, economics of cultivation goes in favor of sweet corn and radish intercropping system, which resulted in maximum net return of ₹ 111.3 thousand per hectare due to maximum green cob equivalent yield. In absence of intercrop, sole sweet corn provided minimum net return of ₹ 79.2 thousand ha-1, which underscores the importance of intercrop with sweet corn.

Adequate supply of plant nutrients due to additional application of fertilizer accelerated the plant growth rate, which was reflected in enhancement of yield and yield attributing factors. Additional production of photosynthates due to addition of plant nutrients in the soil resulted in considerably higher values of yield attributing characters. Maximum number of cobs (75.1 thousand ha-1) with higher cob weight (295.5 g cob-1 with husk) were produced in the treatment, where 160:80:80 kg N:P2O5:K2O per hectare was applied. The optimum value of cob weight (278.0 g) with and without husk (169.8 g) was attained at fertility level of 120:60:60 kg N:P2O5:K2O ha-1. Massey and Gaur (2006) also obtained heaviest cobs with application of 120 kg N and 60 kg K2O ha-1. The number of kernels per cob and weight of kernel have linearly increased with additional application of plant nutrients from external sources, which confirms the earlier findings of Jaliya *et al.* (2008). Absence or inadequate supply of plant nutrients at the time of reproductive phase might be the cause of lighter cob production under deficient or no supply of fertilizers.

Supplementary addition of every dose of plant nutrients increased the yield of green cob attaining the maximum value of 11.74 t ha-1 at the fertility level of 160:80:80 kg N:P2O5:K2O ha-1. It was of course statistically comparable with application of 120:60:60 kg N:P2O5:K2O ha-1.The optimum yield (10.61 t ha-1) of green cob was recorded at the fertility level of 120:60:60 kg N:P2O5:K2O ha-1, which is 225 per cent higher than the control plot because of 93.5, 31.0 and 19.1 per cent more cob weight (with husk), kernel per cob and kernel weight, respectively. Similar finding was also reported by Dangariya *et al.* (2017), who obtained the optimum yield of green cob with application of 120 kg N and 60 kg P2O5 per hectare.

Major nutrients like nitrogen, phosphorus and potash play a pivotal role in root development, formation of protein & chlorophyll and enhanced vegetative growth thereby influencing fodder yield of sweet corn. Abundant supply of plant nutrients through application of 160:80:80 kg N:P2O5:K2O ha-1 resulted in the maximum yield (33.58 t ha-1) of green fodder, of course statistically similar to the fertility level of 120 kg nitrogen, 60 kg phosphorus and 60 kg of potash per hectare. Similar findings have also been reported by Massey and Gaur (2006), who obtained maximum fodder yield with application of 120 kg N and 60 kg P2O5 per hectare. Increase in fertility level linearly increased the yield of intercrop, which was reflected in green cob equivalent yield. Optimum value of green cob equivalent yield (14.32 t ha-1) was obtained with the fertility level of 120 kg N, 60 kg P2O5 and 60 kg K2O per hectare, which was 183.0 per cent higher than the control plot (Table 2).

Supplementary provision of plant nutrients increased the net profit (₹ 136.7 thousand ha-1) up to application of 120 kg nitrogen and 60 kg each of phosphorus & potash per hectare, beyond which the effect was not significant. Yield enhancement with additional application of plant nutrients was the sole reason of augmentation of net profit. Similar observations were also reported by Kumar and Chawla (2018), who obtained maximum net return and benefit-cost ratio with application of 150 kg N, 50 kg P2O5 and 60 kg K2O ha-1. Application of 120 kg N, 60 kg P2O5 and 60 kg K2O ha-1 was found suitable to obtain optimum value for yield of green cob & green fodder and net profit.

**CONCLUSION**

Based on the results of this experiment, it is inferred that application of 120 kg N, 60 kg P2O5 and 60 kg K2O per hectare to sweet corn intercropped with radish is appropriate to obtain optimum yield of sweet corn, green cob equivalent yield and net profit.

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**Table 1. Effect of intercropping and fertility level on yield parameters of sweet corn**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment** | **Plant stand at harvest (’000 ha-1)** | **No. of cobs (’000 ha-1)** | **Weight of cob with husk (g)** | **Weight of dehusked cob (g)** | **Weight of fresh kernel (g per 100)** | **Kernels per cob** |
| **Intercropping** |  |  |  |  |  |  |
| Sole sweet corn | 62.4 | 66.1 | 235.1 | 136.3 | 29.2 | 314.4 |
| Sweet corn + radish | 61.0 | 63.0 | 222.8 | 127.7 | 28.7 | 308.8 |
| Sweet corn + beans | 59.2 | 61.7 | 204.6 | 125.3 | 28.6 | 295.4 |
| SE(m) ­+ | 1.03 | 1.81 | 7.11 | 2.39 | 0.63 | 5.92 |
| CD (0.05) | NS | NS | NS | NS | NS | NS |
| **N:P2O5:K2O (kg ha-1)** |  |  |  |  |  |  |
| 0:0:0 | 59.5 | 47.6 | 143.7 | 72.3 | 25.6 | 256.4 |
| 40:20:20 | 61.1 | 52.7 | 171.6 | 98.5 | 27.8 | 282.9 |
| 80:40:40 | 61.7 | 69.4 | 215.4 | 131.9 | 29.2 | 304.4 |
| 120:60:60 | 61.4 | 73.2 | 278.0 | 169.8 | 30.5 | 336.0 |
| 160:80:80 | 60.5 | 75.1 | 295.5 | 176.3 | 31.2 | 351.3 |
| SE(m) ­+ | 1.77 | 2.92 | 6.26 | 4.05 | 0.77 | 6.39 |
| CD (0.05) | NS | 8.53 | 18.28 | 11.82 | 2.23 | 18.66 |

**Table 2. Effect of intercropping and fertility level on yield and economics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatments** | **Yield of green cob (t ha-1)** | **Yield of green fodder (t ha-1)** | **Yield of intercrop (t ha-1)** | **Green cob equivalent yield (t ha-1)** | **Net profit** **(**₹ **ha-1)** |
| **Intercropping** |  |  |  |  |  |
| Sole sweet corn | 10.07 | 31.19 | 0.00 | 10.07 | 79.2 |
| Sweet corn + radish | 7.65 | 27.17 | 5.01 | 12.66 | 111.3 |
| Sweet corn + beans | 7.02 | 24.59 | 1.83 | 10.95 | 83.4 |
| SE(m) ­+ | 0.357 | 0.495 | 0.046 | 0.373 | 5.63 |
| CD (0.05) | 1.400 | 1.944 | 0.180 | 1.466 | 22.09 |
| **N:P2O5:K2O (kg ha-1)** |  |  |  |  |  |
| 0:0:0 | 3.26 | 19.68 | 1.26 | 5.06 | 1.4 |
| 40:20:20 | 6.43 | 24.18 | 1.83 | 8.86 | 57.9 |
| 80:40:40 | 9.17 | 28.96 | 2.46 | 12.37 | 109.5 |
| 120:60:60 | 10.61 | 31.86 | 2.86 | 14.32 | 136.7 |
| 160:80:80 | 11.74 | 33.58 | 2.99 | 15.51 | 151.0 |
| SE(m) ­+ | 0.439 | 1.481 | 0.146 | 0.442 | 6.31 |
| CD (0.05) | 1.280 | 4.322 | 0.427 | 1.291 | 18.43 |