Himachal Journal of Agricultural Research Vol. 32(2) : 33-35, 2006

Productivity and profitability of tea as influenced by multi-nutrient application in wet temperate zone of Himachal Pradesh

S. P. Dixit, R. P. Sharma, D. K. Sharma*, K. L. Sharma*, G. Sharma* and N. Sharma*
Department of Soil Science
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur - 176 062.

Abstract

A study was conducted during 2002 and 2003 on a Typic Hapludalf at Palampur, H.P. to assess the effect of multi-nutrition *viz.*, N, P, K, S, Zn and B on the productivity and profitability of tea. The soil was silty clay loam in texture, acidic in reaction (pH 5.23) and the status of organic carbon, available N,P and K was 12g/kg, 296, 8 and 108 kg/ha, respectively. The pooled results of two years revealed that the green tea leaf yield was highest in $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ *i.e.* 7984 kg/ha as compared to the rest of the treatments. The per cent increase in green tea leaf yield with this treatment over control, farmer's practice and state recommended dose was 93, 49 and 40. Net returns (Rs/ha) during 2002 and 2003 were 55,377 and 76,786 and were highest among all the treatments. The benefit cost ratio was highest in state recommended dose treatment (1.73 and 2.97) during both years followed by $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ (1.43) during 2002 and $N_{350}P_{150}K_{175}S_0B_0Zn_0$ (2.86) during 2003, respectively.

Introduction

Tea (*Camellia sinensis* (L.) O. Kuntze) is one of the most important commercial crop of India. It is grown on an area of 443 thousand hectares with total annual production of about 855 thousand metric tonnes of made tea. India ranks first in production and consumption of tea (FAO, 2004). In Himachal Pradesh, tea is grown in the districts of Kangra and Mandi covering an area of 2,300 hectares with a production of 1.46 million kg of made tea. The average tea productivity in the state is quite low (636 kg/ha) as compared to national average (1930 kg/ha). Among various reasons, poor nutrient management is the major one, which calls for the immediate attention of the growers. Since, tea is a heavy feeder, moreover and native fertility of these soils is low to medium and replenishment of plant nutrients through external sources is indispensable to harness full potential of this crop. Earlier workers like Sharma and Sharma (1995) have evaluated the effect of N, P, K and S on productivity of tea but the response of tea to these elements collectively and in the presence of micronutrient was not studied so far. Therefore, present investigation was undertaken to evaluate the effect of multi-nutrient (N, P, K, S, Zn and B) application on the productivity of tea and also to find out the best treatment from economic point of view.

Material and Methods

A field experiment was conducted during 2002 and 2003 in the Tea Research Farm of CSK Himachal Pradesh Agricultural University, Palampur. Thirteen treatment combinations were evaluated in randomized block design and each treatment was replicated thrice. The treatment combinations were $N_{350}P_{150}K_{175}S_{20}B_{1.5}Zn_6$, $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$, $N_{350}P_{50}K_{175}S_{20}B_{1.5}Zn_6$, $N_{350}P_0K_{175}S_{20}B_{1.5}Zn_6$, $N_{350}P_{150}K_{87.5}S_{20}B_{1.5}Zn_6$, $N_{350}P_{150}K_0S_{20}B_{1.5}Zn_6$, $N_{350}P_{150}K_{350}S_{20}B_{1.5}Zn_6$, $N_{350}P_{150}K_{175}S_{20}B_{1.5}Zn_0$, $N_{350}P_{150}K_{175}S_{20}B_0Zn_0$, $N_{350}P_{150}K_{175}S_0B_0Zn_0$, state recommended dose (N: P_2O_5: K_2O; 90: 90: 40 kg/ha), farmer's practice (N: P_2O_5: K_2O; 120: 90: 40 kg/ha) and control.

The plot size was 45 m² containing twenty bushes at a spacing of 1.5x1.5 m. The soil was acidic in reaction (pH 5.23), silty clay loam in texture and Typic Hapludalf. The contents of organic carbon, available N, P and K were 12g/kg, 296, 8 and 108 kg/ha, respectively. Tea shoot samples (two leaves and a bud) and tea leaf samples consisting of third leaf were collected during the three plucking seasons i.e. summer (April- June), monsoon season (July- August) and back end season (September- October) of both the years. The yield of individual season has been summed up and total yield have been given in this

**Department of Tea Husbandry and Technology, CSK HPKV, Palampur.*

paper. The economics of different treatments was calculated on the basis of prevalent prices of inputs and out put.

Results and Discussion

Green leaf yield

The pooled data of 2002 and 2003 pertaining to the effect of multi-nutrient application on total productivity of green tea leaf yield (kg/ha) have been embodied in Table 1 and critical examination of the data revealed that all the treatments involving multi-nutrient application recorded higher yield over state recommended dose, farmers' practice as well as control during both the years of experimentation. Highest yield of green tea leaf(7984 kg/ha) was recorded under $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ .Per cent increase in green tea leaf yield with the application of $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ over control, farmer's practice and state recommended dose was 93, 49 and 40 . The results clearly demonstrated the superiority of multi-nutrient application over state recommended dose consisting of N, P and K only. Regarding the response of tea to individual nutrient, it was observed that P application up to 150kg P_2O_5/ha except 0 and 50 Kg P_2O_5/ha, which were statistically same. The per cent increase over no K was 34 and 16 during 2002 and 2003, respectively. In case of potassium, the yield significantly increased up to 175 kg/ha and beyond this level there was decrease in its yield, the increase was 14 per cent due to 175 kg K_2O/ha over no K. Similarly, tea responded significantly to Zn application @ 6 kg/ha and the increase in green leaf yield was 6 per cent over no Zn. Application of S @ 20kg/ha increased the green tea leaf yield by only 2 per cent over no S and it was not significant. Similarly boron application @ 1.5 Kg/ha enhanced (4%) the yield of tea significantly over no B, but it was not significant. Rahman and Jain(1985) and Sharma and Sharma (1995) also reported similar increase in yield of tea due to multi-nutrient.

Table1. Effect of multinutrient on green tea leaf yield

Treatments	Pooled Yield (kg/ha)
$N_{350}P_{150}K_{175}S_{20}B_{1.5}Zn_6$	7150
$N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$	7984
$N_{350}P_{50}K_{175}S_{20}B_{1.5}Zn_6$	6682
$N_{350}P_0K_{175}S_{20}B_{1.5}Zn_6$	6470
$N_{350}P_{150}K_{87.5}S_{20}B_{1.5}Zn_6$	6665
$N_{350}P_{150}K_0S_{20}B_{1.5}Zn_6$	6286
$N_{350}P_{150}K_{350}S_{20}B_{1.5}Zn_6$	7107
$N_{350}P_{150}K_{175}S_{20}B_{1.5}Zn_0$	6692
$N_{350}P_{150}K_{175}S_{20}B_0Zn_0$	6440
$N_{350}P_{150}K_{175}S_0B_0Zn_0$	6340
State Rec. NPK	5687
G.F. Practice	5370
Control	4137
CD(P=0.05)	324

Economic analysis

In this study, economics of each treatment was worked out to know that which treatment combinations is most economic one. It is evident from the figure 3 that maximum net returns were obtained under the treatment combination $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ amounting to Rs. 55,377/ha and Rs. 76,786/ha during 2002 and 2003, respectively. In absolute terms, the returns were higher by Rs. 13,767 and Rs. 13,428/ha over state recommended dose during 2002 and 2003, respectively. Similarly, the increase in net returns were higher by 19,596 & 15,126/- over farmer's practice during 2002 and 2003, respectively. Conversely, B/C ratio was slightly higher in case of state recommended dose, having the values 1.73 and 2.97 for the year 2002 and 2003, respectively (Figure 2). The B/C ratio values for the treatment combination $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ were 1.43 and 2.15 for the year 2002 and 2003, respectively.

The lower values of B/C ratio in case of multi-nutrient treatment are understandable because this treatment involves use of micronutrients and unlike macro-nutrients; no subsidy is available for micronutrients presently. However taking into consideration the total net returns and sustainable productivity of tea, it is advantageous to go for the application of different nutrients and the treatment $N_{350}P_{100}K_{175}S_{20}B_{1.5}Zn_6$ has been found most remunerative.

Figure 1 : Effect of multinutrient on net returns (Rs/ha) in tea crop

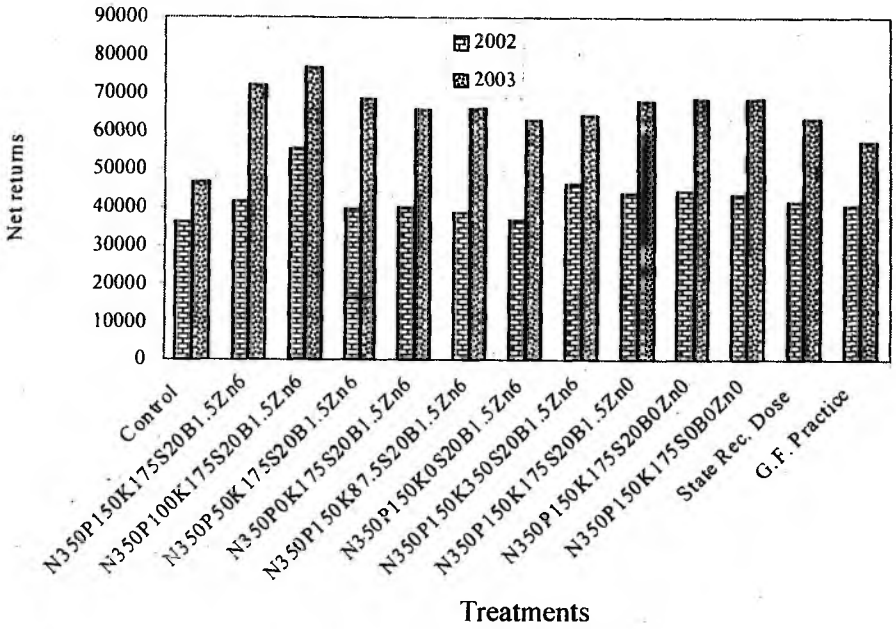
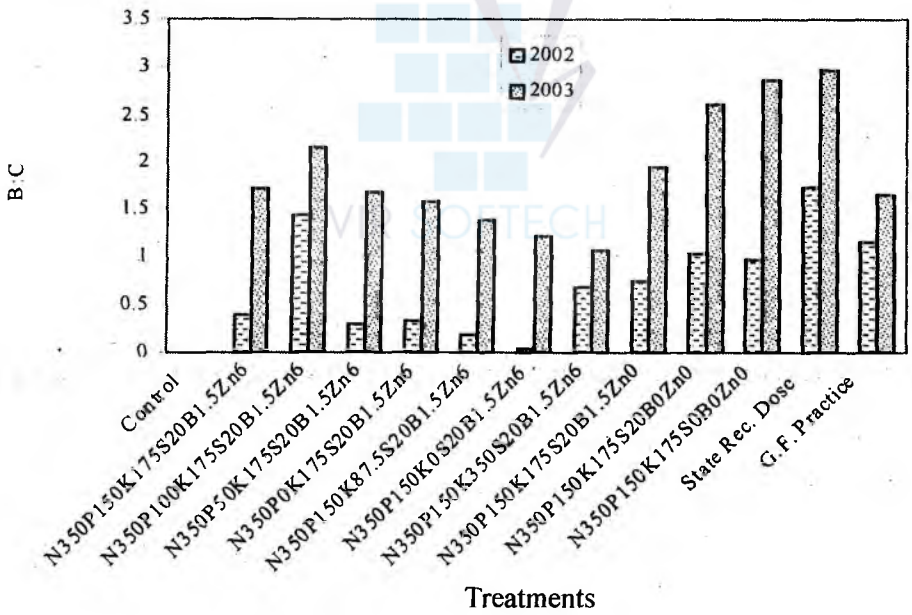


Figure 2 : Effect of multinutrient on benefit cost ratio in tea crop



References

FAO 2004. *Food and Agricultural Organization.* Quarterly Bulletin Statistics, FAO.

Rahman, F. and Jain, N. K. 1985. Long term response of light leaf Assam tea (*Camellia sinensis* L. (O) Kuntze) to phosphate and potash application in North West India. *Journal of Plantation Crops* 13 (2): 104-115.

Sharma, K. L. and Sharma, D. K. 1995. Long term reaponse of China hybrid tea (*Camellia sinensis*) to nitrogen, phosphorus and potassium in Himachal Pradesh. *Indian Journal of Agricultural Sciences* 65 (10): 733-737.