ABSTRACT

Field experiments regarding “Studies on enhancing the productivity and profitability of wheat and mentha intercropping under different methods of crop establishment” were conducted on silty clay loam soil which was high in organic carbon, low in available nitrogen and high in available phosphorus and potassium during winter to summer seasons of 2006-07 and 2007-08 at Gurdaspur using the randomized block design with three replications. Wheat was sown in November and mentha crop was intercropped in February. In the first experiment, the treatments comprised of two (T_1), three (T_2) and four (T_3) rows of wheat with 20 cm row spacing and two rows of mentha on outer sides of wheat rows covering a total width of 67.5, 135 and 135 cm in flat situation, respectively. As sole crop, wheat and mentha were sown at 22.5 and 60 cm row spacing under T_4 and T_5 in flat situation, respectively. On beds, two (T_6), three (T_7) and four (T_8) rows of wheat with 20 cm row spacing were grown with two rows of mentha on outer sides of wheat rows on the bed top covering a total width of 67.5 (37.5 cm top + 30 cm furrow), 135 (105 cm top + 30 cm furrow) and 135 (105 cm top + 30 cm furrow) cm, respectively. Sole wheat at 20 cm row spacing (T_9) and sole mentha with 60 cm row spacing (T_10) were sown on the bed top covering a total width of 67.5 cm (37.5 cm top + 30 cm furrow) and 120 cm (90 cm top + 30 cm furrow), respectively. In the second experiment, two planting methods viz. two rows of wheat with 20 cm row spacing and two rows of mentha on outer sides of wheat rows under flat and bed (37.5 cm top + 30 cm furrow) method covering a total width of 67.5 cm were combined with five levels of nitrogen i.e. 0+0, 90+75, 120+75, 150+75 and 180+75 kg N ha⁻¹ to wheat and mentha, respectively.

Among different intercropping systems, two rows of wheat with 20 cm row spacing and two rows of mentha on outer sides of wheat rows on the bed top (T_6) recorded significantly higher values of growth and yield attributes of both wheat and mentha and higher wheat grain equivalent yield, profitability, land equivalent ratio, area time equivalent ratio, production efficiency, agronomic efficiency of the intercropping system.
The treatment $T_6$ recorded 139.4 q ha$^{-1}$ of wheat grain equivalent yield of the system which was significantly higher over $T_1$, $T_8$, $T_7$, $T_3$, $T_2$ by 5.6, 13.1, 13.4, 18.3 and 19.7 per cent, respectively. Maximum net returns of Rs. 76085/- were obtained under $T_6$ and it gave 8.9, 10.3, 12.2, 18.7 and 23.0 per cent higher net returns over $T_1$, $T_8$, $T_7$, $T_3$, $T_2$, respectively. Both flat and bed sown treatments having three or four rows of wheat on 135 cm width and two rows of mentha on outer sides of wheat rows recorded less values of growth, yield and yield attributes of wheat and mentha than their respective method having two rows of wheat on 67.5 cm width and two rows of mentha on outer sides of wheat rows. In mentha, both the planting methods were on par in growth, herbage and essential oil yield of mentha during 2006-07 but bed planting was significantly higher during 2007-08 due to higher rainfall. Physico-chemical properties viz. specific gravity, refractive index, optical rotation and menthol content of mentha oil were affected marginally by intercropping and planting methods.

Increasing levels of nitrogen enhanced the growth, yield and yield attributes of wheat significantly upto 120 kg N ha$^{-1}$ and further increase was not effective. On pooled average basis, bed planted wheat @ 120 kg N ha$^{-1}$ recorded 11.8 per cent higher grain yield of wheat over flat @ 150 kg N ha$^{-1}$. Application of nitrogen to wheat had no carry over effect on all the parameters of mentha. No application of nitrogen recorded higher leaf: stem ratio of mentha than N @ 75 kg ha$^{-1}$. In wheat-mentha intercropping system, bed planting gave significantly higher wheat grain equivalent yield over flat and both the methods responded significantly upto 120 + 75 kg N ha$^{-1}$ for wheat and mentha, respectively. Maximum pooled net returns of Rs 86188 ha$^{-1}$ in wheat-mentha intercropping system were recorded under the bed with N @120 (wheat) + 75 (mentha) kg ha$^{-1}$ which were higher by 11.3 per cent over flat with N @150 (wheat) + 75 (mentha) kg ha$^{-1}$. The optimum dose of N for wheat-mentha intercropping system under flat and bed sown situation was 238.9 and 208.7 kg ha$^{-1}$, respectively.

Keywords: Wheat, mentha, intercropping, planting method, flat, bed and net returns.