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Mentha intercropping with wheat- a boon for the farmer's

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Abstract

Wheat is the major *rabi* crop of U.P. All category of farmers are growing this crop for eating and selling purposes. Wheat straw also plays a key role as fodder for animals round the year. It is sufficient to state that wheat crop is the lifeline for the farmers of both rural and urban areas. But, due to the increase in the labours and input cost, the declining agriculture land holdings, the wheat-growers are not getting attractive returns. Keeping this in view, agriculture experts provided the production technology through training, field and exposure visits and diagnosed the problems and giving their solutions for promoting the mentha inter cropping with wheat. Study on mentha intercropping with wheat was carried out at farmer's field in the district Sambhal during the year of 2018-19 & 2019-20. The study revealed that mentha intercropping with wheat is increasing the income of the farmers. Besides this benefit of mentha intercropping system, it also resulted in increased organic matter in the soil and employment in the rural areas. Due to this increased organic matter in the soil, water holding capacity and sustainability of the soil also improved. The mentha intercropping with wheat may be adopted for most effective profitable than the sole wheat crop.

Keywords: Intercropping, Sustainability, Economics, Profitability

Introduction

Wheat (*Triticum aestivum*) belongs to the family of Gramineae. It is grown as a major crop in *rabi* season in district Sambhal. District Sambhal comes under Western U.P. and is the leading agricultural district. Sugarcane, Paddy, wheat, mustard and Urdbean are the main crops of the district. The sugarcane covers around 30-35% of the total area. Paddy, wheat and sugarcane are the main crop rotation of the district. The cultivation of menthol mint become popular progressively since then and spread gradually in vast area of the Uttar Pradesh and small to large areas of Punjab, Haryana, Madhya Pradesh and Bihar (Khanuja *et al.* 2005) [2] It is a potential source of natural menthol and other ingredients like mint terpenes, menthone, isomenthone, menthyl acetate etc. Mentha plays a very significant role in the agricultural economy. The crop is economically significant not only for its contribution to the livelihood of thousands of farmers but also for its highly diversified industrial use in confectionery, cosmetics and pharmaceutical sectors. In *rabi* season, the wheat crop is sown in 45-50% area. Farmers start wheat sowing in the last week of November up to the first week of January. About 60% area of wheat is sown as late in December and January. Due to late sown, farmers are not getting good yields resulting in a decline in farmers' incomes. Some farmers were growing mentha crop alone and using inappropriate techniques which resulted in not getting sufficient profits. As the cropping system highly location specific, it urges for evaluation of these two crops in a system mode to ensure efficient use of the available growing period. Relay planting of mint in wheat and mint transplanting after harvesting of wheat are a feasible options for system intensification. Further, intercropping of mint with wheat could be most remunerative than their sole cropping. (Rathi *et al.* 2014) [7] also found wheat + menthol mint intercropping system more remunerative as compared to sole cropping of wheat crop. In mentha-wheat intercropping system, mentha is planted in the mid-January to the first week of February. At this stage, wheat posses shading effect which detrimental for the growth of mentha. Keeping this in view, Krishi Vigyan Kendra scientists drove the Special Awareness

Program and provided the technology in the scientific way which helped the farmers. Now, mentha intercropping with wheat has proved is a boon for the farmers.

Materials and Methods

This study was carried out at a farmer's field in the district of Sambhal during 2018-19 and 2019-20. There are 8 blocks in the district, 4 blocks i.e. Baniya-Khera, Bahjoi, Rajpura and Junawai were selected for the study. Three villages from each block, which is total of 12 villages were randomly selected and six farmers from each village, which is a total of 72 farmers were selected including all categories of farmers (small, marginal and large). In both the years, late sown variety of wheat i.e. DBW-16, PBW-373 and DBW-71 were sown in line, fertilisers dose was applied based on soil testing. The mentha variety Shivalik, Golden, CIM-Saryu, and Koshi were sown in January between 2 row of wheat and plant to plant distance was 20cms. To control of weeds, Pendimethalin 30 EC at 1.0 Kg a.i. ha⁻¹ was applied within two days of wheat sowing. For control of weeds in mentha, one hand hoeing was given immediately after the harvest of wheat crop. Cultural practices were conducted as per scientific recommendation after harvesting of wheat in April followed with regular cultural practices and two cutting of mentha were completed till June and sold to the Mentha Oil Extraction Unit. The oil content of mentha crop was extracted by steam distillation methods using Clevenger's type essential oil apparatus. Yield and other observation data collected and average were calculated.

Results and Discussions

The cost of cultivation of mentha intercropping with wheat and sole wheat crop in the study area show in table-1, the average cost of cultivation of mentha intercropping with wheat for the year 2018-19 was Rs 59909.00 ha⁻¹ and in 2019-20 it was Rs 59900.00 ha⁻¹. The average cost of cultivation for both the years was Rs 59904.50 ha⁻¹. The cost of cultivation of sole wheat crop for the year 2018-19 was Rs 37109 ha⁻¹

and in 2019-20 it was Rs 38125 ha⁻¹. The average cost of cultivation of sole wheat of both years was Rs 37617 ha⁻¹.

In Table -2, In mentha intercropping with the wheat system, the average production of the wheat yield in 2018-19 was 38.60 qt ha⁻¹, wheat straw 41.95qt ha⁻¹ along with 158.66 qt ha⁻¹ mentha herbage which provided 84.64 kg Mentha Oil. While in 2019-20 it was 38.80 qt ha⁻¹ wheat yield, 42.39 qt ha⁻¹ wheat straw along with mentha herbage 161.49qt ha⁻¹ which provided 85.88 kg Mentha oil. In both years average wheat yield was 38.17qt ha⁻¹, wheat straw 42.17qt ha⁻¹, Mentha herbage 160.26qt ha⁻¹ which provided 85.26 kg ha⁻¹ average Mentha oil. Tuteja S.S., R Lakpale, Singh A.P. and Tripathi R.S. (2007) [8] also proved that the sole crop of wheat gives 45.18qt ha⁻¹ wheat in 2018-19 and 45.08qt ha⁻¹ in 2019-20. The average wheat production of both years was 45.13qt ha⁻¹ and the wheat straw average yield of both years in sole crop system was 48.55qt ha⁻¹.

The comparative net return of mentha intercropping with wheat and sole wheat crop in the study area show in table-3. The average gross return in mentha intercropping with wheat was found to be Rs 187332.00 ha⁻¹ and the net return was Rs 1,27427.00 and in Sole wheat crop system the average gross return was Rs 98558.00 ha⁻¹ and net return was Rs 61341.00 ha⁻¹, the scientists involved were Kumar S, Yadav R.P. and Singh A K.(2008) [3]. The average net return for both the years in mentha intercropping was significantly higher in comparison to the net return of sole wheat crop system. Brar S.K. Gill B.S. Brar A.S. and Kaur T. (2014) [1] also proved that the B:C ratio in sole crop system of wheat was 2.63 and in mentha intercropping system B:C was 3.13. It was also higher than sole crop system. The above study revealed that Mentha intercropping with wheat is more profitable than the sole of wheat- A boon for the Farmers. Kumar S., Bahl J.R. Bansal R.P., Gupta A.K., Singh V., and Sharma S. (2002) [4]. Mentha intercropping with wheat also improve the soil health and water holding capacity in the soil in comparison to sole wheat crop system Zhang F.Y., Wu P.T., Zhao X.N. and Cheng X.F. (2012) [9] also supported the study.

Table 1: Cost of cultivation of the mentha and wheat crop in conventional technique ha⁻¹

Detail		Details cost of cultivation(Rs.ha ⁻¹)					
		Mentha with wheat			Sole wheat crop		
Blocks	Village	2018-19	2019-20	Average	2018-19	2019-20	Average
Baniya khera	1-Paltha Mithanpur	59900	60600	60250	38600	39000	38800
	2-Raholi	61000	60000	60500	36800	38200	39500
	3-Gumthal	60300	61200	60750	37500	38600	38050
	Average	60400	60600	60500	37634	38600	38117
Bahjoi	1- Sadatbari	60800	61100	60950	37600	37800	37700
	2- Achalpur	61600	59700	60650	38000	38500	38250
	3- Pathakpur	58900	60600	60250	38400	39000	38700
	Average	60767	60467	60617	38000	38434	38217
Rajpura	1- Maksudanpur	59700	58800	59250	36000	37100	36550
	2- Bhikampur	58300	59600	58950	36700	38300	37500
	3- Basantpur Tanda	59200	59100	59150	35800	37700	36750
	Average	59067	59167	59117	36167	37700	36934
Junawai	1- Sarai Brahman	59500	59900	59700	37000	38500	37750
	2- Nagla Ajmeri	60000	59300	59650	36300	37800	37050
	3- Rasulpur	58700	58900	58800	36600	37000	36800
	Average	59400	59367	59384	36634	37767	37200
Overall average		59908.5	59900.0	59904.5	37108.75	38125.25	37617

Table 2: Production details of mentha intercropping with wheat and sole wheat crop ha⁻¹

Blocks	Village	Production details of Mentha Intercropping with wheat												Production details of Sole wheat crop					
		Wheat production (qt. ha ⁻¹)			Wheat straw (qt. ha ⁻¹)			Mentha herbage (qt. ha ⁻¹)			Mentha Oil Yield (Kg. ha ⁻¹)			Wheat (qt. ha ⁻¹)			Wheat straw (qt. ha ⁻¹)		
		1 Year	2 Year	Av.	1 Year	2 Year	Av.	1 Year	2 Year	Av.	1 Year	2 Year	Av.	1 Year	2 Year	Av.	1 Year	2 Year	Av.
Baniya Khara	Palthamithanpur	39.80	38.40	39.10	43.48	43.44	42.71	148.45	164.60	161.53	85.71	87.05	86.38	46.80	45.85	46.33	45.96	49.62	47.79
	Raholi	38.35	40.05	39.20	41.88	43.31	42.82	160.74	163.26	162.00	86.65	85.93	86.29	44.35	46.51	45.43	47.82	50.41	49.12
	Gumthal	39.56	39.75	39.65	43.21	42.42	43.31	159.30	165.40	162.35	85.98	87.40	86.69	45.08	44.78	44.93	48.70	49.34	48.52
	Average	39.24	39.40	39.32	42.86	43.04	42.95	159.49	164.42	161.96	86.12	86.79	86.46	45.41	45.71	45.56	47.49	49.46	48.48
Bahjoi	Sadatbari	38.95	39.75	39.35	42.54	43.42	42.98	159.50	161.35	160.37	85.35	86.50	85.93	45.75	45.65	45.70	49.50	49.38	49.44
	Achalpur	37.30	38.35	37.83	40.73	41.88	41.30	150.45	159.20	159.83	85.94	85.15	85.54	46.85	46.90	45.88	50.82	48.48	49.65
	Pathakpur	39.45	40.25	39.85	43.09	43.97	43.53	158.65	163.05	160.85	84.83	86.83	85.83	45.50	46.95	46.23	49.20	50.94	50.07
	Average	38.97	39.45	39.21	42.12	43.09	42.60	159.53	161.20	160.37	85.37	86.16	85.77	46.03	45.83	45.93	49.84	49.60	49.72
Rajpura	Maksudanpur	38.65	39.25	38.95	42.21	42.87	42.54	157.54	156.76	157.15	85.24	84.46	84.85	44.75	45.10	45.93	48.30	48.72	48.51
	Bhikampur	37.35	37.80	37.58	40.78	41.28	41.03	155.80	159.64	157.72	83.06	85.90	84.48	46.20	44.30	45.25	50.04	47.76	48.90
	BasantpurTand	38.20	38.68	38.44	41.72	42.25	41.98	158.26	160.40	159.33	85.80	86.62	86.21	44.25	44.00	44.13	47.70	47.40	47.55
	Average	38.40	38.58	38.49	41.57	42.14	41.86	157.20	158.93	158.07	84.70	85.66	85.18	45.13	44.47	44.80	48.68	47.96	48.32
Junamai	Sarai Brahman	37.74	37.38	37.56	41.21	40.82	41.02	158.75	166.35	162.55	82.45	86.61	84.53	44.60	45.45	45.03	48.12	49.14	48.63
	Nagla Ajmeri	38.37	37.78	38.07	41.90	41.26	41.58	162.00	160.20	161.10	83.40	84.65	84.03	44.85	44.25	44.05	47.22	47.70	47.46
	Rasulpur	37.28	38.24	37.76	40.71	41.76	41.24	154.50	157.70	156.10	82.23	83.42	82.33	42.10	43.20	43.65	47.52	46.44	46.98
	Average	37.80	37.79	37.80	41.27	41.28	41.28	158.41	161.42	159.92	82.36	84.89	83.63	44.18	44.30	44.24	47.62	47.76	47.69
Overall average		38.60	38.80	38.70	41.96	42.39	42.17	158.66	161.49	160.08	84.64	85.88	85.26	45.19	45.08	45.13	48.41	48.69	48.55

Table 3: Comparative Net Return of Mentha INTER cropping with wheat (Rs. ha⁻¹)

S.No.	Income details of Mentha Intercropping with Wheat							Income details of the sole wheat crop					
	Details	Production (qt. ha ⁻¹)	Rs./qt	Gross return	Cost	Net return	B:C	Production (qt. ha ⁻¹)	Rs. (per qt.)	Gross return	Cost	Net return	B:C
1	Wheat yield	38.70	1870.00	187332.00	59904.50	127427.00	3.13	45.13	1870.00	98558.00	37617.00	61341.00	2.63
2	Wheat straw	42.17	300.00					48.55	300.00				
3	Mentha herbage	160.08	-					-	-				
4	Mentha oil yield	85.26Kg	1200/Kg					-	-				

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