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Impact Assessment of Organic and Inorganic Fertilizers on Growth, Yield and Fruit Quality of Phalsa (*Grewia subinaequalis*. L)

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A B S T R A C T

An experiment was carried out during December, 2018 to May, 2019 in the Research Field, Department of Horticulture, NAI, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design (RBD), with eleven treatments of Organic and Inorganic fertilizers, each treatment were replicated thrice. The combinations of the treatments were T_0 (Control), T_1 (NPK- 100:50:100 g + 10 kg FYM/bush), T_2 (NPK- 150:100:150 g + 10 kg FYM/bush), T_3 (NPK- 100:50:100 g + 8 kg poultry manure/bush), T_4 (NPK- 150:100:150 g + 8 kg poultry manure/ bush), T_5 (NPK- 100:50:100 g + 5 kg sheep manure/bush), T_6 (NPK- 150:100:150 g + 5 kg sheep manure/bush), T_7 (NPK- 100:50:100 g + 5 kg vermicompost/bush), T_8 (NPK- 150:100:150 g + 5 kg vermicompost/bush), T_9 (NPK- 100:50:100 g + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg vermicompost/bush) and T_{10} (NPK- 150:100:150 g + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg vermicompost/bush) respectively. The studies shows that treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) was found to be superior over other treatments in terms of growth, yield and quality of Phalsa, whereas Treatment T_0 (Control) and treatment T_1 (NPK- 100:50:100 gm + 10 kg FYM) was found significantly superior to all other treatments in respect of Cost of cultivation, Net Return (Rs./ha), Gross return (Rs./ha) and B:C ratio.

Introduction

Phalsa *(Grewia subinaequalis* L.) also known as minor utilize fruit it is subtropical fruit native to India which belongs to family Tiliaceae. This family has about 41 genera and 400 species, which are mostly distributed in the tropical and sub-tropical region of the world. It is commercially grown in Punjab, Haryana, Gujarat, Maharashtra and Bihar. Its cultivation is favored around big cities where fruits find ready and quick to sale. Regarding keeping quality, it is highly perishable in nature. It may be grown as an intercrop with Mango, Anola, Bael and Ber. Phalsa is a bushy plant and can be grown in kitchen garden also.

Phalsa is good crop for arid and semi-arid regions because of its hardy nature and

capacity to tolerate high temperature and even grown under prolonged dry with little care. It is bushy in nature and bears small berry like fruits which is reddish brown in colour. Phalsa flowers in February and the fruit ripen by the end of April and continue till June.

The Phalsa fruit beside being relished in the fresh condition due to its sub acid taste are highly esteemed when they are turned into juice or syrup, it makes most popular summer drinks of country which is attractive natural light purple color. It has pleasing flavour with cooling effect on the digestive system. Ripe fruits are sub acidic and good source of vitamin 'A' and vitamin 'C'. They are also fair source of phosphorus and iron.

Organic manures are the plant and animal wastes that are used as nutrients after decomposition. Organic manures when added to soil undergo microbial decomposition. In that process, the nutrients held in organic combination are slowly released in available forms besides improving the availability of nutrient elements present in the soil. In addition, the organic carbon level of the soil also increased when the manures are used continuously. More ever, the living phase of the soil is greatly stimulated. This would help not only in bio degradation but in nitrogen fixation, phosphorus solubility and increasing the availability of plant nutrients to crops.

Materials and Methods

The Experiment was conducted in Randomized Block Design (RBD) with 11 treatments of Organic and inorganic sources of fertilizers where each treatment replicated thrice, Research field, Department of Horticulture, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during December, 2018 to May, 2019. The combination of the treatments were adopted *viz.* T_0 (Control), T_1 (NPK-100:50:100 g + 10 kg FYM/bush), T_2 (NPK-150:100:150 g + 10 kg FYM/bush), T_3 (NPK-100:50:100 g + 8 kg poultry manure/bush), T_4 (NPK- 150:100:150 g + 8 kg poultry manure/ bush), T_5 (NPK- 100:50:100 g + 5 kg sheep manure/bush), T_6 (NPK- 150:100:150 g + 5 kg sheep manure/bush), T_7 (NPK- 100:50:100 g + 5 kg vermicompost/bush), T_8 (NPK-150:100:150 g + 5 kg vermicompost/bush), T_9 (NPK- 100:50:100 g + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg vermicompost/bush) and T_{10} (NPK-150:100:150 g + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg vermicompost/bush) respectively.

The area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46^{o} C- 49^{o} C and seldom falls as low as 2^{o}C- 5^{o}C. The relative humidity ranges between 20% to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

Results and Discussion

An experiment entitled "Impact Assessment of Organic and Inorganic Fertilizers on growth, yield and fruit quality of Phalsa (*Grewia subinaequalis*. L)" was carried out during December, 2018 to May, 2019 in Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The results of the investigation, pertaining the effect of Organic and inorganic sources of fertilizers growth, yield and fruit quality of Phalsa, have been discussed and result interpreted in light of the previous research work done in India and abroad.

Results on growth attributes

In terms of Numbers of canes per bush, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) recorded maximum (15.88 canes/bush) followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (13.73 canes/bush), minimum (8.45 canes/bush) was noticed in T_0 (Control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Phalsa .Similar findings on vegetative growth previously also reported by Athani *et al.,* (2007) and Ram and Pathak (2007) in Guava.

In terms of Days to sprouting, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) take minimum (35.42 days), followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (39.54 days). maximum (48.89 days) was noticed in T_0 (control). The decreased in the number of days taken for sprouting of shoots in best treatment of organic and inorganic fertilizers in Phalsa is due to combined effect of the organic manures and Chemical fertilizers. The Similar results on vegetative growth previously also obtained by Bhobia (2005), Naik and Babu (2007) and Ram and Pathak (2007) in the Guava, Verma *et al.,* (2015) in Phalsa.

In terms of number of sprouted shoots per canes, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) recorded maximum (10.28, 13.11, 20.23 and 25.34 sprouted shoots per canes) at 60, 80, 100 and 120 days respectively, followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (8.88, 10.89, 16.23 and 21.09), and minimum (6.27, 7.26, 9.57 and 12.49) recorded with T_0 (control). The increase in number of sprouted shoots per canes in best treatment is due to different treatment combination of organic and inorganic fertilizers. Which is due to incorporation of organic manure. With nitrogen fertilizer or recommended dose of inorganic fertilizer the Similar findings on vegetative growth has been reported by Naik and Babu (2007), Ram and Pathak (2007) in Guava and Verma *et al.,* (2015) in Phalsa.

In terms of number of leaves per shoots, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) recorded maximum (13.51, 18.49, 22.43 and 27.79 leaves per shoots) at 60, 80, 100 and 120 days respectively, followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (11.75, 16.29, 20.08 and 24.42 leaves), and minimum (7.73, 11.39, 13.37 and 17.87 leaves) recorded with T_0 (control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Phalsa. Similar findings on vegetative growth also reported by Naik and Babu (2007), Ram and Pathak (2007) in Guava and Verma *et al.,* (2015) in Phalsa were also observed (Table 1).

In terms of Length of shoots, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) recorded maximum (32.63, 50.51, 71.53 and 83.88 cm) at 60, 80, 100 and 120 days respectively, followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (26.86, 45.36, 62.16 and 72.91 cm), and minimum (15.27, 30.19, 48.55 and 59.54 cm) recorded with T_0 (control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Phalsa. Similar findings on vegetative growth also reported by Naik and Babu (2007), Ram and Pathak (2007) in Guava and Verma *et al.,* (2015) in Phalsa were also observed.

In terms of number of flowers per shoot, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) recorded maximum (142.35 flowers) followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (132.88 flowers), and minimum (92.53 flowers) was recorded in T_0 (control). In terms of Number of fruiting nodes per shoots, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) recorded maximum (11.07, 12.66, 19.51 and 23.69 nodes) at 60, 80, 100 and 120 days respectively, followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (9.68, 11.42, 17.12 and 20.68 nodes), and minimum (5.30, 6.36, 8.90 and 13.11) was recorded with T_0 (control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Phalsa. Similar finding previously also reported by Verma *et al.,* (2015) in Phalsa.

Post harvest observations

In terms of Number of fruit per bush, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) gave maximum (2870 fruits/bush) followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (2530 fruit/bush) and minimum (1515 fruit/bush) was noticed with T_0 (control).

The Number of fruit was significantly effect by organic manures and NPK the Similar result has been obtained by Vadiraj *et .al.* (1993) in cardamom, Athani *et al.,* (2009) and Dhomane *et al.,* (2011) in Guava and Verma *et al.,* (2015) in Phalsa.

In terms of fresh weight of 100 fruits, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) gave maximum (85.22 g) followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (75.61 g) whereas minimum (43.21 g) was noticed with T_0 (control). The fruit weight was significantly effect by organic manures and NPK the Similar result has been obtained by Vadiraj *et .al.* (1993) in cardamom, Athani *et al.,* (2009) and Dhomane *et al.,* (2011) in Guava and Verma *et al.,* (2015) in Phalsa (Table 2).

Table.1 Influence of organic and inorganic source of fertilizers on growth, attributes of Phalsa.

Treatment Symbol	Treatment Combinations	Number of canes per bush	Days of sprouting shoots	Number of sprouted shoots per canes				Number of leaves per shoots				Length of shoots (cm)				Number of flowers per shoot
				60 DAP	80 DAP	100 DAP	120 DAP	60 DAP	80 DAP	100 DAP	120 DAP	60 DAP	80 DAP	100 DAP	120 DAP	
T_0	Control (0% RDF)	8.45	48.89	6.27	7.26	9.57	12.49	7.73	11.39	13.37	17.87	15.27	30.19	48.55	59.54	92.53
T_1	NPK- 100:50:100 gm + 10 kg FYM/bush	10.65	44.30	7.18	7.98	11.78	15.72	8.86	12.95	15.59	19.13	19.88	35.30	51.97	65.12	118.53
T_2	NPK- 150:100:150 gm + 10 kg FYM/bush	13.14	43.01	7.36	8.58	13.61	17.81	9.73	14.02	17.26	21.54	22.21	38.12	54.83	67.51	122.55
T_3	NPK- 100:50:100 gm + 8 kg poultry manure/bush	11.79	45.53	6.70	7.79	11.58	16.25	9.26	13.26	16.26	19.55	19.26	36.13	51.95	65.41	108.13
T_4	NPK- 150:100:150 gm + 8 kg poultry manure/ bush	12.05	42.71	7.06	8.13	12.24	17.07	9.61	13.83	17.50	21.44	20.26	36.14	52.81	65.00	111.50
T_5	NPK- 100:50:100 gm + 5 kg sheep manure/bush	11.77	43.15	7.65	8.71	12.68	18.07	9.81	14.46	18.19	20.82	18.24	34.01	49.47	61.16	115.86
T_6	NPK- 150:100:150 gm + 5 kg sheep manure/bush	11.88	42.30	7.80	9.02	13.83	17.92	10.52	13.95	17.40	22.21	19.37	35.21	52.52	64.47	120.03
T_7	NPK- 100:50:100 gm + 5 kg Vermicompost/bush	12.84	41.72	7.97	8.76	13.52	18.56	10.53	15.60	18.40	22.42	23.67	40.48	57.13	68.84	121.82
T_8	NPK- 150:100:150 gm + 5 kg Vermicompost/bush	13.30	40.09	8.78	9.79	14.59	21.52	11.18	16.05	18.93	23.09	24.12	42.17	59.19	70.59	128.86
T_9	NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush	13.73	39.54	8.88	10.89	16.23	21.09	11.75	16.29	20.08	24.42	26.81	45.36	62.16	72.91	132.88
T_{10}	NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush	15.88	35.42	10.28	13.11	20.23	25.34	13.51	18.49	22.43	27.79	32.63	50.51	71.53	83.88	142.35
F-test		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
SE(d)		0.280	1.076	0.310	0.303	0.783	0.945	0.395	0.661	0.640	0.877	0.826	1.370	1.365	1.552	2.102
C.V.		2.784	3.107	4.865	4.075	7.042	6.305	4.731	5.553	4.412	4.917	4.605	4.357	3.004	2.809	2.154
C.D. at 5%		0.588	2.261	0.652	0.636	1.646	1.984	0.830	1.388	1.344	1.842	1.736	2.878	2.868	3.261	4.416

Table.2 Response of organic and inorganic sources of fertilizers on fruit quality and yield parameters of Phalsa (*Grewia subinaequalis* L.)

Treatment Symbol	Treatment Combinations	Number of fruiting nodes per shoots				Number of fruits/bush	Fresh weight of 100 fruits (g)	Fruit yield/bush (kg)	Fruit yield (q/ha)	TSS (°Brix)	Reducing sugar per cent	Total sugar per cent	Titrable acidity %	Ascorbic acid (mg/100 g)	Benefit cost ratio
		60 DAP	80 DAP	100 DAP	120 DAP										
T_0	Control (0% RDF)	5.30	6.36	8.90	13.11	1,515	43.21	0.65	25.96	19.12	2.09	6.20	2.91	34.82	1:2.57
T_1	NPK- 100:50:100 gm + 10 kg FYM/bush	8.28	9.47	12.80	16.22	2,217	60.79	1.33	53.54	20.91	2.36	7.91	2.77	35.56	1:1.97
T_2	NPK- 150:100:150 gm + 10 kg FYM/bush	9.40	10.67	13.20	17.49	2,332	63.86	1.47	58.81	22.59	2.40	8.36	2.67	38.82	1:1.87
T_3	NPK- 100:50:100 gm + 8 kg poultry manure/bush	7.89	9.22	13.10	16.94	2,167	58.50	1.26	50.39	20.60	2.26	7.90	2.69	35.90	1:1.71
T_4	NPK- 150:100:150 gm + 8 kg poultry manure/ bush	8.57	9.77	12.66	16.13	2,208	60.97	1.33	53.20	21.91	2.37	8.17	2.62	36.07	1:1.58
T_5	NPK- 100:50:100 gm + 5 kg sheep manure/bush	8.25	9.45	12.39	16.39	1,956	49.73	0.96	38.43	20.51	2.32	8.35	2.80	36.17	1:1.42
T_6	NPK- 150:100:150 gm + 5 kg sheep manure/bush	8.70	9.87	12.85	16.48	2,055	55.19	1.12	44.85	21.86	2.38	8.31	2.65	37.38	1:1.43
T_7	NPK- 100:50:100 gm + 5 kg Vermicompost/bush	8.87	10.02	13.34	17.92	2,174	60.81	1.32	52.83	21.38	2.37	7.95	2.50	38.53	1:1.38
T_8	NPK- 150:100:150 gm + 5 kg Vermicompost/bush	9.19	10.96	14.31	18.75	2,276	62.01	1.41	56.40	22.44	2.42	9.62	2.44	40.20	1:1.32
T_9	NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush	9.68	11.42	17.12	20.68	2,530	75.61	1.90	76.01	24.34	2.48	8.55	2.39	40.63	1:1.02
T_{10}	NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush	11.07	12.66	19.51	23.69	2,870	85.22	2.43	97.09	25.19	2.53	8.63	2.43	42.60	1:1.23
F-test		S	S	S	S	S	S	S	S	S	S	S	S	S	
SE(d)		0.273	0.371	0.593	0.610	49.566	1.087	0.046	1.799	0.495	0.071	0.302	0.122	1.185	
C.V.		3.868	4.543	5.324	4.242	2.748	2.167	4.102	3.990	2.770	3.706	4.524	5.708	3.831	
C.D. at 5%		0.574	0.778	1.247	1.282	104.120	2.284	0.097	3.780	1.040	0.150	0.635	0.257	2.489	

In terms of fruit yield per bush, treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) gave maximum (2.43 kg fruit) followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) (1.90 kg) whereas minimum (0.65 kg) was noticed with T_0 (control).

In terms of fruit yield (q/ha), treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) gave maximum (97.09 q) followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (76.01 q/ha) whereas minimum (25.96 q/ha) was noticed with T_0 (control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Phalsa .Similar findings on fruit yield also reported by Athani *et al.,* (2009) and Dhomane *et al.,* (2011) in Guava and Verma *et al.,* (2015) in Phalsa were also observed.

Quality attributes

In terms of Total soluble solids, maximum (25.19 ^{o}Brix) was recorded with treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush), followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (24.34 ^{o}Brix). Whereas minimum (19.12 ^{o}Brix) was found in treatment T_0 (control). Increased in Total soluble solids content of fruits in treatments of organic manures, and NPK, previously also reported by Maity *et al.,* (2006) and Das *et al.,* (2015) in Guava, Verma *et al.,* (2015) in Phalsa.

In terms of Reducing Sugar (%), Maximum (2.53 %) was recorded with treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush), followed by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (2.48%), whereas minimum (2.09%) was found in treatment T_0 (control). These were significantly increase fruit yield and Quality parameters of the fruit due to the different treatment combination. These results are conformity with the findings has been by Maity *et al.,* (2006) and Das *et al., (*2015) in Guava, Verma *et al.,* (2015) in Phalsa.

In terms of total sugar (%), Maximum (9.62 %) was recorded with treatment T_8 (NPK- 150:100:150 gm + 5 kg Vermicompost/bush) followed by T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (8.63%) whereas minimum (6.20%) was recorded in treatment T_0 (control).

In terms of titrable acidity (as % malic acid) minimum (2.39 %) was recorded in treatment T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) followed by T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (2.43%) whereas the maximum (2.91%) was recorded in treatment T_0 (control).

In terms of Ascorbic acid (mg/100g), maximum (42.60 mg) was recorded in treatment T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) followed

by T_9 (NPK- 100:50:100 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) with (40.63 mg) whereas the minimum (34.82 mg) was recorded in treatment T_0 (control). These were significantly increase fruit yield and Quality parameters of the fruit due to the different treatment combination. These results are conformity with the findings has been by Maity *et al.,* (2006) and Das *et al., (*2015) in Guava, Verma *et al.,* (2015) in Phalsa.

Economics of cultivation and cost benefit ratio

In terms of Maximum Gross return (Rs. 776720/ha) was recorded in treatment T_{10}, Maximum Net return (Rs.219759/ha) was recorded in treatment T_2 and maximum cost benefit ratio (1:2.57) was recorded with treatment T_0, followed by treatment T_1 with 1:1.97 and the minimum Gross return – Rs. 207680/ha was found in treatment T_0 (control), minimum Net return Rs. 13540/ha and cost benefit ratio 1:1.02 was recorded in treatment T_9.

On the basis of experimental findings it is concluded the treatment combination T_{10} (NPK- 150:100:150 gm + 10 kg FYM + 8 kg poultry manure + 5 kg sheep manure + 5 kg Vermicompost/bush) was found superior over other treatments in terms of growth, yield and quality of Phalsa, and Treatment T_0 (Control) and treatment T_1 (NPK- 100:50:100 gm + 10 kg FYM) was found significantly superior to all other treatments in terms of economic returns of Phalsa.

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