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Research Article

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, LEAF YIELD AND ECONOMICS OF SPINACH (*BETA VULGARIS* L.) VAR. PUSA JYOTI

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Abstract: The present investigation entitled "Effect of integrated nutrient management on growth, leaf yield and economics of spinach (*Beta vulgaris* L.) var. Pusa Jyoti" was carried out during *kharif* 2016-17 (first year), 2017-18 (second year) and pooled at the Experimental field, Krishi Vigyan Kendra, RVSKVV, Datia (M.P.) with 16 treatment combinations of three levels of inorganic fertilizers i.e. 50% RDF (75:40:50 kg NPK ha^{-1}), 75% RDF (112.5:60:75 kg NPK ha^{-1}) and 100% RDF control (150:80:100 kg NPK ha^{-1}), three organic manure *i.e.* 20 t FYM ha^{-1}, 10 t vermicompost (VC) ha^{-1} and 7.5 t poultry manure (PM) ha^{-1} and two bio-fertilizers *viz*,. 5 kg Azotobacter (Azo) ha^{-1} and 5 kg PSB ha^{-1}.Experiments were laid out in Randomized Complete Block Design with three replications. Results revealed that the application of 75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg *Azotobacter* ha^{-1} (T_8)was recorded significantly maximum plant height, number of leaves plant^{-1}, fresh and dry weight ofleaves plant^{-1} and leaves yield hectare^{-1}at first year, second year and pooledas compared to control. The net return of Rs 1,79,592 ha^{-1} and cost benefit ratio 1: 3.88 was found maximum with the application of 75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}(T_{12}) it also gave the leafyield 241.93 q ha^{-1}(Rank third and at par with T_8) but the significantly maximum leaf yield of 253.57 q ha^{-1} was obtained in the treatment T_8 (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1})it was gave net return of Rs 1,50,232 ha^{-1} and cost benefit ratio 1: 2.45 as compared to treatment T_{14} (50% RDF + 10 t VC ha^{-1} + 5 kg Azo. ha^{-1} + 5kgPSBha^{-1}).Due to high price of vermicompost, the net returns and cost: benefit ratio of the treatments with vermicompost were relatively low in spite of high green yield and gross return when compared with that of Poultry Manure.Applicationof75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg *Azotobacter* ha^{-1} was economically viable treatment.

Keywords: *Spinach, Bio-fertilizers, INM and Economics*

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Introduction

Spinach beet (*Beta vulgaris* var. bengalensis; 2n=2x=18), commonly known as „Indian spinach" in English and „Palak" in Hindi, originated from Indo-Chinese region (Nath, 1976) belongs to the genus Beta, specie vulgaris and family Chenopodiaceae. Spinach Beet or Palak (*Beta vulgaris* var. bengalensis) also known as Indian Spinach, Spinach beet, Garden Beet, Palongpalang, Sag, Teegabatchali, Busabyeley, Dumpsbucchale and Pasalai can be grown in tropical and sub tropical regions. Leafy vegetables play important role in the diets of an individual by providing essential nutrients necessary for proper upkeep is well recognized. It is very rich in minerals and vitamins "A" and "C" and also contents appreciable amounts of protein, calcium, iron and roughages. Its high productivity of large green leaves with succulent stem almost throughout the year make it highly remunerative to the vegetable growers. The increasing population and limited land forced out formers to maximize crop yields per unit area through intensive cultivation. Excessive use of inorganic fertilizers creates environment related problems and situation can be improved through the use of biofertilizer (Saadatnia and Riahi, 2009). Bio-fertilizers being essential components of organic farming play a vital role in maintaining long term soil fertility and sustainability by fixing atmospheric nitrogen, mobilizing fixed macro and micro nutrients or convert insoluble phosphorous in the soil into forms available to plants, by increasing their efficiency and availability. Biofertilzers are less expensive, eco-friendly and sustainable likely to assume greater significance as a compliment or supplement to inorganic fertilizers. Azotobacteris an aerobic, free-living gram negative bacterium which fixes nitrogen from the atmosphere. The phosphate solubilising bacteria are increases in the availability of phosphorus in the soil through secretion of phosphatase enzyme which leads to transfer organic phosphorus to available form. Consequently, it increases phosphorus absorption and accumulation in plant. Excessive reliance on the chemical fertilizers may not be a viable strategy in the long run because of the cost, both in domestic resources and its foreign exchange, involved in setting up of fertilizer plants and sustaining the production and impact on environment. In this context, use of organic manures would be the viable option for farmers to increase productivity per unit area. The organic manures such as FYM, vermicompost and poultry manure can improve the properties of soil exposed to drought by increasing the limited moisture holding capacity. Organic matter changes the physical properties like soil structure and it also changes the chemical properties of the soil through increasing the soil pH, C/N ratio, cation exchange capacity and ion uptake. Organic manures improves the soil tilth, aeration, water holding capacity of the soil and stimulates the activity of micro-organisms in the soil that make the elements readily available to the crops. However, the information on individual and combine use of these biofertilizers is very limited. It is also essential to take up such study at various places for site specific nutrient management and to assess the efficacy of biofertilizer. The use of organic manures and bio-fertilizers can reduce the application of chemical fertilizers to a great extent. It is possible when to reduce the use of the chemical fertilizers which will be beneficial for formers to reduce their production costs and the soil will be high in fertility and productivity Kawthar *et al*. (2014).

Table-1 *Effect of integrated nutrient management on plant height, number of leaves plant^{-1}, fresh weight of leaves plant^{-1} at 60 DAS in first, second year and pooled of spinach*

Treat. Symb.	Treatment	Plant height (cm) at			No. of leaves plant^{-1} at			Fresh weight of leavesplant^{-1} (g) at		
		I Year	II Year	Pooled	I Year	II Year	Pooled	I Year	II Year	Pooled
T_{1}	75% RDF + 20 t FYMha^{-1}	32.41	33.67	33.04	18.50	19.97	19.23	63.92	65.72	64.82
T_{2}	75%RDF+20 t FYMha^{-1} +5kgPSBha^{-1}	33.45	35.05	34.25	19.25	20.72	19.99	65.87	67.67	66.77
T_{3}	75%RDF+20 t FYMha^{-1}+5kg*Azo.*ha^{-1}	34.35	35.95	35.15	20.10	21.57	20.83	67.10	68.90	68.00
T_{4}	75%RDF+20tFYMha^{-1}+5kgPSBha^{-1}+5kg *Azo.*ha^{-1}	35.49	37.42	36.45	20.82	22.29	21.55	68.99	71.12	70.05
T_{5}	75% RDF + 10 t Vermicompostha^{-1}	41.42	42.02	41.72	25.21	27.29	26.25	80.54	83.34	81.94
T_{6}	75% RDF+10 tVCha^{-1}+5kgPSBha^{-1}	43.27	47.60	45.43	26.33	28.46	27.39	85.34	88.14	86.74
T_{7}	75%RDF+10tVCha^{-1} +5kg*Azo.*ha^{-1}	46.39	48.99	47.69	29.23	31.69	30.46	91.81	94.94	93.37
T_{8}	75% RDF+10 t VCha^{-1} + 5 kg PSB ha^{-1} + 5 kg *Azo.*ha^{-1}	47.25	49.85	48.55	30.15	32.61	31.38	93.80	96.93	95.37
T_{9}	75% RDF + 7.5 t Poultry Manureha^{-1}	40.46	42.73	41.59	24.25	26.39	25.32	78.50	81.30	79.90
T_{10}	75%RDF+7.5t PMha^{-1}+ 5kg PSB ha^{-1}	42.71	45.31	44.01	25.85	27.97	26.91	83.12	85.92	84.52
T_{11}	75% RDF+7.5 tPMha^{-1}+5 kg *Azo.*ha^{-1}	44.61	47.21	45.91	27.23	29.70	28.47	87.84	90.97	89.41
T_{12}	75% RDF + 7.5 t PMha^{-1} +5kg PSB ha^{-1} + 5 kg *Azo.*ha^{-1}	45.41	48.01	46.71	28.46	30.93	29.69	90.12	93.25	91.69
T_{13}	50% RDF + 20 t FYMha^{-1} + 5 kg *Azo.*ha^{-1} + 5kgPSBha^{-1}	36.32	38.59	37.45	21.66	23.46	22.56	70.73	72.87	71.80
T_{14}	50% RDF + 10 t VCha^{-1} + 5 kg *Azo.*ha^{-1} + 5kgPSBha^{-1}	38.64	40.91	39.77	22.95	24.75	23.85	75.19	77.65	76.42
T_{15}	50% RDF + 7.5 t PMha^{-1} + 5 kg *Azo.*ha^{-1} + 5kgPSBha^{-1}	37.45	39.38	38.41	22.15	23.95	23.05	72.94	75.07	74.01
T_{16}	Control (100 %RDF150:80:100 kg NPKha^{-1})	39.40	41.33	40.37	23.67	25.81	24.74	76.97	79.44	78.21
	SEm±	1.97	1.06	0.93	1.34	1.47	0.82	2.52	2.79	1.54
	C.D. at 5% level	5.69	3.05	2.61	3.88	4.24	2.30	7.27	8.05	4.32

Table-2 *Effect of integrated nutrient management on dry weight of leavesplant^{-1} at 60 DAS, leaves yield q ha^{-1} in first, second year and pooled and economics of spinach*

Treat. Symb	Treatment	Dry weight of leaves (g) at			Leaves yield hectare^{-1} (q) at			Gross income (Rs/ha)*	Expen-diture (Rs/ha)	Net income (Rs/ha)	C: B ratio
		I Year	II Year	Pooled	I Year	II Year	Pooled				
T_{1}	75% RDF + 20 t FYMha^{-1}	11.80	12.40	12.10	172.39	173.04	172.71	172710	56238	116472	3.07
T_{2}	75%RDF+20 t FYMha^{-1} +5kgPSBha^{-1}	12.50	13.10	12.80	175.64	177.76	176.70	176700	56988	119712	3.10
T_{3}	75%RDF+20 t FYMha^{-1}+5kg*Azo.*ha^{-1}	13.10	13.73	13.42	180.41	181.16	180.79	180790	56988	123802	3.17
T_{4}	75%RDF+20tFYMha^{-1}+5kgPSBha^{-1}+5kg *Azo.*ha^{-1}	13.70	14.33	14.02	184.39	186.62	185.51	185510	57738	127772	3.21
T_{5}	75% RDF + 10 t VCha^{-1}	16.90	17.60	17.25	215.72	216.34	216.03	216030	101838	114192	2.12
T_{6}	75% RDF+10 tVC ha^{-1}+5kgPSBha^{-1}	18.20	18.90	18.55	228.40	231.52	229.96	229960	102588	127372	2.24
T_{7}	75%RDF+10tVC +5kg*Azo.*ha^{-1}	20.10	20.83	20.47	247.64	250.61	249.13	249130	102588	146542	2.43
T_{8}	75% RDF+10 t VC ha^{-1} + 5 kg PSB ha^{-1} + 5 kg *Azo.*ha^{-1}	20.50	21.23	20.87	252.27	254.87	253.57	253570	103338	150232	2.45
T_{9}	75% RDF + 7.5 t PMha^{-1}	16.20	16.90	16.55	211.50	216.45	213.98	213980	60838	153142	3.52
T_{10}	75%RDF+7.5t PMha^{-1}+ 5kg PSB ha^{-1}	17.50	18.20	17.85	221.31	223.85	222.58	222580	61588	160992	3.61
T_{11}	75% RDF+7.5 tPMha^{-1}+5 kg *Azo.*ha^{-1}	18.70	19.43	19.07	234.50	236.37	235.44	235440	61588	173852	3.82
T_{12}	75% RDF + 7.5 t PMha^{-1} +5kg PSB ha^{-1} + 5 kg *Azo.*ha^{-1}	19.30	20.03	19.67	241.37	242.48	241.93	241930	62338	179592	3.88
T_{13}	50% RDF + 20 t FYMha^{-1} + 5 kg *Azo.*ha^{-1} + 5kgPSBha^{-1}	14.30	14.98	14.64	189.57	192.09	190.83	190830	55723	135107	3.42
T_{14}	50% RDF + 10 t VC ha^{-1} + 5 kg *Azo.*ha^{-1} + 5kgPSBha^{-1}	15.20	15.88	15.54	201.34	204.60	202.97	202970	101323	101647	2.00
T_{15}	50% RDF + 7.5 t PMha^{-1} + 5 kg *Azo.*ha^{-1} + 5kgPSBha^{-1}	14.80	15.48	15.14	194.37	197.29	195.83	195830	60323	135507	3.25
T_{16}	Control (100 %RDF150:80:100 kg NPKha^{-1})	15.70	16.40	16.05	204.61	208.21	206.41	206410	53845	152565	3.83
	SEm±	0.69	0.63	0.38	6.92	8.41	4.46				
	C.D. at 5% level	1.98	1.81	1.07	19.99	24.30	12.54				

Materials and Methods

The present investigation entitled "Effect of integrated nutrient management on growth, leaf yield and quality of spinach (*Beta vulgaris* L.) var. Pusa Jyoti" was carried out during *rabi* 2016-17 (first year), 2017-18 (second year) and pooled at the Experimental field, Krishi Vigyan Kendra, Datia (M.P.) The experimental material for the present investigation was comprised of 16 treatments combinations of three levels of inorganic fertilizers *i.e.* 50% RDF (75:40:50 kg NPK ha^{-1}), 75% RDF (112.5:60:75 kg NPK ha^{-1}) and 100% RDF control (150:80:100 kg NPK ha^{-1}), three organic manure *i.e.* 20 t FYM ha^{-1}, 10 t vermicompost (VC) ha^{-1} and 7.5 t poultry manure (PM) ha^{-1} and two bio-fertilizers *viz*,. 5 kg Azotobacter (Azo) ha^{-1} and 5 kg PSB ha^{-1}. Experiments were laid out in Randomized Complete Block Design as describe by Panse and Sukhatme (1985) with three replications. Observations were recorded on the basis of five random competitive plants selected from each treatment separately for growth character sand yield parameters were evaluated as per standard procedure and also estimate the economics as suggested by Yang *et al.* (1989). There are some minor differences in data of both the year due to some environmental factors such as temperature, rainfall, humidity and evaporation *etc*. the experimental plants were regularly observed and the data were recorded on plant height, number of leaves plant^{-1}, fresh and dry weight of leaves plant^{-1} and leaves yield hectare^{-1}.

Results and discussion

The plant height was significantly increased by the integrated nutrient management [Table-1]. Significantly maximum 47.25, 49.85 and 48.55 cm plant height was recorded under the treatment T_{8} (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}) were at par with T_{7} (75%RDF+10tVermicompostha^{-1}+5kgAzotobacter ha^{-1}) (46.39, 48.99 and 47.69 cm) and T_{12} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}) (45.41, 48.01 and 46.71 cm) at first year, second year and pooled, respectively and treatments T_{11}, T_{6} and T_{10} in first year and $T_{11}$and T_{6} in second year also at par. While, it was recorded lowest 32.41, 33.67 and 33.04 cm in treatment T_{1} (75% RDF + 20 t FYMha^{-1}) at first year, second year and pooled, respectively [Table-1].These results are in agreement with those ofIbrahim *et al.* (2012), Ali *et al.* (2013), Kawthar *et al.* (2014), Hossain *et al.* (2014), Solangi *et al.* (2015), Shaheen *et al.* (2016), Wahocho *et al.* (2016) and Shormin and Kibria (2018). Significantly maximum 30.15 and 32.61 leaves plant^{-1} were recorded under the treatment T_{8} (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacterha^{-1})followed by T_{7} (75%RDF+10tVermicompostha-1+5kgAzotobacter ha^{-1}) (29.23 and 31.69leaves plant^{-1}), T_{12} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}) (28.46 and 30.93 leaves plant^{-1}), T_{11} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5 kg Azotobacter ha^{-1})(27.23 and 29.70leaves plant^{-1}) and T_{6} (75% RDF+10 t Vermicompost ha^{-1} +5kgPSB ha^{-1})(26.33 and 28.46 leaves plant^{-1}) at first year and second year, respectively and which were at par with each other. While, it was recorded lowest 18.50 and 19.97in treatment T_{1} (75% RDF + 20 t FYM ha^{-1}) at first year and second year, respectively [Table-1].

At pooled, significantly maximum 31.38, 30.46 and 29.69 leaves plant^{-1}were recorded under the treatment T_8 (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}),T_7 (75%RDF+10tVermicompost ha^{-1}+5kgAzotobacter ha^{-1}) and T_{12} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}),respectively and which were at par with each other. While, it was recorded lowest 19.23in treatment T_1 (75% RDF + 20 t FYMha^{-1}) [Table-1].This might be due to availability of nutrients in a balanced proportion from inorganic fertilizers, organic manure and bio fertilizers which improves the plant height and number of leaves plant-1of palak. The faster availability of nutrients from inorganic fertilizers and slow release through organic manure and biofertilizers, the cropping period enhances nutrient requirement of the crop. Similar results have also been reported byJha and Jana(2009),Ibrahim *et al*. (2012), Ali *et al*. (2013),Kawthar *et al*. (2014),Hossain *et al*. (2014), Solangi *et al*. (2015),Shaheen *et al*. (2016),Wahocho *et al*. (2016) and Shorm in and Kibria (2018). It is obvious from data [Table-1] that the significantly maximum 93.80, 96.93 and 95.37 g fresh weight of leaves plant^{-1}were recorded under the treatment T_8 (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1})followed byT_7 (75%RDF+10tVermicompost ha^{-1}+5kgAzotobacter ha^{-1}) (91.81, 94.94 and 93.37 g) and T_{12} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1}) (90.12, 93.25 and 91.69 g)at first year, second year and pooled, respectively and which were at par with each other. While, it was recorded lowest 63.92, 65.72 and 64.82 g in treatment T_1 (75% RDF + 20 t FYMha^{-1}) at first year, second year and pooled, respectively. These results are in close conformity with those ofIbrahim *et al*. (2012), Ali *et al*. (2013), Kawthar *et al*. (2014),Hossain *et al.* (2014),Solangi *et al*. (2015), Shaheen *et al*. (2016),Wahocho *et al*. (2016) and Shormin and Kibria (2018). The significantly maximum 20.50, 21.23 and 20.87 g dry weight of leaves plant^{-1} were recorded under the treatment T_8 (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1})followed byT_7 (75%RDF+10tVermicompost ha^{-1}+5kgAzotobacter ha^{-1}) (20.10, 20.83 and 20.47 g)at first year, second year and pooled, respectively and which were at par with each other, treatment T_{12} and T_{11} was also at parin first year and second year. While, it was recorded lowest 11.80, 12.40 and 12.10 g in treatment T_1 (75% RDF + 20 t FYM ha^{-1})at first year, second year and pooled, respectively [Table-2].The better efficiency of integrated nutrient management might be due to the availability of nutrients at an optimum level and microbial activity in the soil. Plants get nutrients throughout the growing period which led to higher fresh and dry weight of leaves plant^{-1}. These results are in close conformity with those of Ibrahim *et al*. (2012), Ali *et al*. (2013),Kawthar *et al*. (2014),Hossain *et al*. (2014),Shaheen *et al*. (2016),Wahocho *et al*. (2016) and Shormin and Kibria (2018). Significantly maximum 252.27, 254.87 and 253.57 q ha^{-1} leaves yield was noted under the treatment T_8 (75% RDF + 10 t Vermicompostha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacterha^{-1}) followed by T_7 (75%RDF+10tVermicompostha^{-1}+5kgAzotobacter ha^{-1}) (247.64, 250.61 and 249.13 q ha^{-1})and T_{12} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kgPSB ha^{-1} + 5 kg Azotobacter ha^{-1})(241.37, 242.48 and 241.93 qha^{-1}) at first year, second year and pooled, respectively and which were at par with each other. While, it was recorded lowest 172.39, 173.04 and 172.71 qha^{-1}in treatment T_1 (75% RDF + 20 t FYM ha^{-1}) [Table-2].The increment of yield could be ascribed to additive effect of both sources of nutrient (organic and inorganic) associated with microbial population through inoculation of Azotobacter and PSB (biofertilizers) helping in mobilizing P and N fixation in to soil solution in soluble from, there by higher release of both nutrient forms, this in turn reflected in promoted growth and proliferation of root, increased the rate of absorption, increased photosynthesis productivity and better source-sink relationship. Results of the present investigation was also in confirmatory with the findings of Jha and Jana(2009),Ibrahim *et al.* (2012),Ali *et al*. (2013),Kawthar *et al*. (2014),Solangi *et al*. (2015),Shaheen *et al*. (2016) and Wahocho *et al*. (2016). Higher money value and less cost of cultivation are desirable traits for getting higher returns. Hence economics of the treatments was work out. Results revealed from the [Table-2] that the significantly maximum leaf yield of 253.57 q ha^{-1} was obtained in spinach variety Pusa Jyoti in the treatment T_8 (75% RDF + 10 t Vermicompost ha^{-1} + 5 kg PSB ha^{-1} + 5 kg Azotobacter ha^{-1})it was gave net return of Rs 1,50,232 ha^{-1} and cost benefit ratio 1: 2.45but the treatment T_{12} (75% RDF + 7.5 t Poultry Manure ha^{-1} + 5kg PSB ha^{-1} + 5 kg Azotobacterha^{-1})gave the leaf yield 241.93 q ha^{-1}(Rank third and at par with T8)exhibited maximum net return of Rs 1,79,592ha^{-1} and cost benefit ratio 1: 3.88 in pooled. However, the lowest leaf yield of 172.71 q ha^{-1}, net return of Rs1,16,472 ha^{-1} and cost benefit ratio 1: 3.07 was noted inT_1 (75% RDF + 20 t FYM ha^{-1})but lowest net return of Rs 1,01,647ha^{-1} and cost benefit ratio 1: 2.00 was obtained in treatment T_{14} (50% RDF + 10 t Vermicompost ha^{-1} + 5 kg Azotobacter ha^{-1} + 5kgPSBha^{-1}).Due to high price of vermicompost, the net returns and cost: benefit ratio of the treatments with vermicompost were relatively low in spite of high green yield and gross return when compared with that of Poultry Manure. Similar results have also been reported by Choudhary *et al*. (2008),Jha and Jana(2009), Giridhar Kalidasu (2009),Singh *et al*. (2010)and Mehta and Patel (2011).

Application of Research: Study of nutrient management in spinach and also give brief information about of integrated nutrient management in spinach.

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Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Research Farm, ICAR- Krishi Vigyan Kendra, Datia

Cultivar / Variety name: Spinach (*Beta vulgaris* L.) - Pusa Jyoti

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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