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Performance of Integrated Nutrient Management on growth, yield and quality of strawberry cultivar winter drawn in Baksa district, Assam, India

[1]Amrita Khound*, [2]D. Sharmah, [3]M. Neog, [4]P. K. Pathak and [5]Gariyashi Tamuly

[1]Krishi Vigyan Kendra (AAU), Darrang, Assam, India
[2]Krishi Vigyan Kendra (AAU), Dibrugarh, Assam
[3, 4]AAU, Jorhat, Assam, India
[5]Krishi Vigyan Kendra (AAU), Baksa, Assam, India

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ABSTRACT

The present demonstration was conducted under Krishi Vigyan Kendra, Baksa during 2018, 2019 and 2020 to identify a integrated plant nutrient supply through balanced fertilization of organic, inorganic and bio-fertilisers in strawberry cv. Winter Down and potential effect on growth and yield attributing parameters were investigated. Results revealed that Strawberry cultivar winter dawn showed superior performance on growth parameters like plant height (23.78 cm), number of leaves (26.71nos), numbers of runners (5.98 nos) and length of runners (67.25 cm) per plant in *Azotobacter* + PSB + vermicompost + 50% Recommended Dose of Fertilizers (RDF)as compared to other treatments whereas control showed the minimum growth in all parameters. The plot treated with *Azotobacter* + PSB + vermicompost + 50% RDF also showed early flowering (47.79 days) with more number of flowers (46.23nos.) and early fruiting with more numbers of fruit per plant (36.62nos.) in strawberry cv. winter dawn as comparison to other treatments. The Individual fruit weight (35.67g) found larger in plot treated with *Azotobacter* + PSB + vermicompost + 50% RDF that varies significantly from plot treated with 100% RDF(34.57g), 50% FYM + 50% RDF (33.76g) and 50% Vermicompost + 50% RDF (33.87g) and control (13.59g). The highest yield per plant (538.29g) was obtained from *Azotobacter* + PSB + vermicompost + 50% RDF treated plot whereas (528.18g), (527.17g), (527.28g), (528.19g) and (241.19g) were achieved from 100% RDF, RDFwith N in two split dose as basal and before the onset of flowering, 50% FYM + 50% RDF and 50% Vermicompost + 50% RDF and control respectively and varies significantly among them. The *Azotobacter* + PSB + Vermicompost + 50% RDF treated plot found better combination of nutrient management practices in straw berry cultivation both in quality and yield point of view.

***Key words**: Strawberry, Nutrient management, Yield, Quality and Economics*

Introduction

Strawberry is considered as one of the most important delicious and soft fruit among the berries. The fleshy fruit is a good source of Vitamin-C (40-120 mg/100g of fruit), protein and minerals like potassium, phosphorus, calcium and iron (Kanupriya, 2002) as well as foliate and photochemical compound such as the elligic acid. As compared to other berry fruits, strawberries contain a higher percentage of vitamin-C, phenolics and flavonoids (Hakkinen and Torronen, 2000). Strawberry can be cultivated in a wide range of soil varying from light sand to heavy clay but grows best in humus rich

light porous soil (Sharma and Singh, 1999; Sharma, 2002). Straw berry cv. Winter Dawn is more economic as compared to Sweet Charly and farmer's variety at the farmers field for better production due to the better adoption with the present prevailing climatic condition of Assam (Khound *et al*., 2021).

Appropriate nutrient management is essential as it affects vegetative growth as well as production of crop (Sharma *et al.,* 2006). Application of inorganic fertilizers is essential for enhancement of growth, development, yield and quality of strawberry, but continuous non-judicious use of inorganic fertilizers may cause deficiency of micronutrients and create hazardous effect on soil fertility and poor crop yield (Singh and Singh, 2009). Nutrient management as well as maintenance of soil fertility is crucial for increased yield and fruit quality of strawberry and both macro and micro nutrients have positive effect on strawberry crop production (Trejo-Tellez and Gomez, 2014 and Trpathi *et al.*, 2017).

Soil enzyme activity, available nitrates, carbon to total organic carbon ratio of organic manures enhance the soil fertility Okwuagwu *et al.,* (2003). Organic farming plays an important role by improving soil health as well as enzymatic activity of fruit plants (Kumar *et al*, 2018). Biofertilizers help in increase of production by nitrogen fixation, phosphate solubilization and releasing hormones, vitamins and growth promoting substances (Bamboriya *et al.,* 2018) leading to increase of yield and quality of fruits. Keeping above view, to adopt a judicious integrated application of organic and inorganic nutrients along with biofertilizers in enhancing crop growth, yield and quality of strawberry, the demonstration was performed.

Materials and Methods

The present field study was conducted under Krishi Vigyan Kendra (AAU), Baksa, Assam, during 2018–2020. The experimental area is located at 26.67 N latitude and 91.35 E longitude at an elevation of 46-54 m above mean sea level, representing the Plain zone of Assam. The uniform plantlets (runners) of strawberry cv. Winter down were transplanted in first week of September, 2018 on raised beds at spacing 30cm x 30 cm (P-P)and30 cm x 30 cm (R-R),

The experiment was laid out in a randomized block design with 5 treatment combinations, replicated forth according to Gomez and Gomez (1983). The treatments comprised following combinations, *i.e*.

T_1. 100 % Recommended Dose of Fertilisers (RDF)
T_2. 50% Farm Yard Manure (FYM) + 50% RDF
T_3. 50% Vermicompost + 50% RDF
T_4. *Azotobacter* + PSB + Vermicompost + 50% RDF
T_5.Control(Without manure, chemical fertilizer or Azotobacter inoculation).

Inorganic fertilizers used were Urea (46.6% N), Single superphosphate (SSP, 16% P2O5) and Murate of potash (MOP, 60% K2O) and Phosphorus and potassium was applied as basal dose in all treatments as per the requirement. The total recommended dose of inorganic manure and organic fertilizers was converted into N, P and K nutrients (330 kg N, 140 kg P_2O and 290 kg K2O) and then the cumulative dose was applied through different treatment combinations of organic manures (FYM: 5 kg N, 2 kg P_2O_5 and 5 kg K_2O ton^{-1}; vermicompost 10 kg N, 7 kg P_2O_5 and 8 kg K_2O ton^{-1} on moist weight basis) and Azotobacter inoculation (4.2 $x10^9$ CFUg-1). The required dose of FYM and vermicompost in the treatments to supply half ofthe N is 33 ton ha-1 and 16.5 ton ha-1 respectively. Organic manure was evenly incorporated in the upper 25 cm of the soil profile, whereas, phosphatic and potassic fertilizers were applied as basal application. Azotobacter (4.2 $x10^9$ $CFUg^{-1}$) was inoculated in the runners before transplanting @2 kg ha^{-1} by dipping the runner roots for 10-15 minutes (Dixit, 2001; Sharma, 2002). Black polythene mulch was used on each bed to reduce weed problem as well as moisture from soil. Data on each treatment was collected and analyzed SPSS computer based software.

Results and Discussion

The present demonstration was conducted under Baksa District of Assam during 2018, 2019 and 2020 to identify effect of balanced fertilization of organic, inorganic and bio-fertilisers in strawberry cv. Winter Down and potential effect on growth and yield attributing parameters were investigated. Results revealed that Strawberry cultivar winter dawn showed superior performance on growth parameters like plant height (23.78 cm), number of leaves (26.71nos), numbers of runners (5.98nos) and length of runners (67.25 cm) per plant in *Azotobacter* + PSB + vermicompost + 50% Recommended Dose of Fertilizers (RDF) as compared to other treatments whereas control showed the minimum growth in all parameters.(Table 1). The study of Yadav *et al.,*

(2016) and Khalil and Agah, (2017) on effect of organic, inorganic and biofertilizer based integrated nutrient management for nitrogen supply on growth of strawberry revealed that biofertilizer along with half of the Nitrogen through organic manuring *viz.*, vermicompost and remaining half Nitrogen through inorganic fertilization significantly increased sustainable growth and yield of strawberry in field condition confirms the present finds. A judicious integrated application of organic and inorganic nutrients along with biofertilizers may help in enhancing crop growth, yield and quality of strawberry (Subraya *et al.,* 2017) as well as sustaining soil health (Meena *et al.,* 2019) is in support of the present findings

The plot treated with *Azotobacter* + PSB + vermicompost + 50% RDF also showed early flowering (47.79 days)with more number of flowers (46.23nos) and early fruiting with more numbers of fruit per plant (36.62nos) in strawberry cv. winter dawn as comparison to other treatments (Table 2). The present finding is in conformity with the findings of Beer *et al.,* (2017).Individual fruit weight (35.67g) found larger in plot treated with *Azotobacter* + PSB + vermicompost + 50% RDF that varies significantly from plot treated with 100% RDF (34.57g), 50% FYM + 50% RDF (33.76g) and 50% Vermicompost + 50% RDF (33.87g) and control (13.59g)(Table 2). Table 2 indicated that highest yield per plant (538.29g) was obtained from *Azotobacter* + PSB + vermicompost + 50% RDF treated plot whereas (528.18g), (527.17g), (527.28g), (528.19g) and (241.19g) were achieved from 100% RDF, RDF with N in two split dose as basal and before the onset of flowering, 50% FYM + 50% RDF and 50% Vermicompost + 50% RDF and control respectively and varies significantly among them. Beer *et al.,* (2017) and Khalil and Agah, (2017) studied the effect of organic, inorganic and bio-fertilizers on different growth parameters and yield of strawberry and found that integrated application of vermicompost (25 ton ha^{-1}) + *Azotobacter* (6 kg ha^{-1}) + NPK (70:80:80 $kgha^{-1}$) needed minimum number of days to produce first flower, produced maximum number of flowers per plant, number of fruit set per plant, superior fruit quality and highest yield of strawberry that confirms the present findings. The *Azotobacter* + PSB + Vermicompost + 50% RDF treated plot found better combination of nutrient management practices in straw berry cv Winter

Table 1. Variation in growth parameters of strawberry cv. Winter down in different treatments

Treatments	Plant height (com)	Leaf/plant (Nos)	Runners/ plant (Nos)	Length of runners/plant (cm)
T_1	22.38	25.69	5.34	65.08
T_2	21.56	24.39	4.79	64.68
T_3	21.65	24.49	4.99	65.88
T_4	23.78	26.71	5.98	67.25
T_5 (Control)	15.62	12.38	3.12	45.38
CD (5%)	3.23	3.83	1.61	3.19
S Ed	1.53	1.75	0.75	1.45

Data are the mean of four replications

Table 2. Yield attributing parameters of strawberry cv. Winter Downdue to different treatments

Treatments	Flower bud initiation (Days)	Planting to harvesting (Days)	Flower/ plant (Nos)	Fruit/ plant (Nos)	Fruit weight (g)	Yield/ plant (g)
T_1	48.30	66.20	45.00	35.61	34.57	528.19
T_2	52.31	67.22	44.67	34.72	33.76	527.17
T_3	47.88	65.98	44.78	34.81	33.87	527.28
T_4	47.79	65.89	46.23	36.62	35.67	538.29
T_5 (Control)	66.33	81.76	24.27	18.55	13.59	241.19
CD (5%)	3.83	4.47	2.55	2.55	2.62	6.38
S Ed	1.79	2.09	1.19	1.19	1.22	2.98

Data are the mean of four replications

down cultivation both in quality and yield point of view.

Conclusion

From the present demonstration, it can be concluded that the integrated nutrient application with *Azotobacter* + PSB + Vermicompost + 50% RDF found better combination of nutrient management practices in straw berry cv winter down cultivation both in quality and yield point of view.

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