

## Original Research Article

### **Response of Bottle Gourd (*Lagenaria siceraria* (Mol.) Standl.) to Integrated Nutrient Management**

#### **ABSTRACT**

A field experiment was conducted during *Kharif* 2019 at, All India Co-ordinate Research project, (AICRP), College of Agriculture, Odisha University of Agricultural and technology (OUAT). The experiment consisted of twelve treatments with three replications evaluated in randomized block design. Results of field experiment revealed that the minimum days to seed germination (7.00days) was recorded under T<sub>12</sub> whereas the maximum days to seed germination (10.00days) were under control. Whereas, maximum vine length (49.8, 187.7, 285.95cm), number of branches (6.18, 7.43, 8.12) at 30, 60, 75 DAS, leaf length (22.87cm), leaf width (21.76cm), leaf weight (48.14g), stem diameter(2.77cm), number of nodes on main vine (42.12), node bearing 1<sup>st</sup> male flower (4.16), node bearing 1<sup>st</sup> female flower (6.87), fresh wt. of fruit (1231g), dry wt. of fruit (48.75g), no. of seeds fruit<sup>-1</sup> (448), fruit yield (28.01 q ha<sup>-1</sup>) was recorded with treatment 50%RDF+ FYM @ 7.5t ha<sup>-1</sup>+ VC @ 2.5 t ha<sup>-1</sup>+ biofertilizer Consortia (T<sub>12</sub>) and minimum under control (T<sub>1</sub>).

*Keywords:* Bottle gourd, nutrient, growth, flowering, yield, organic, inorganic, productivity

#### **INTRODUCTION**

The diverse climate of India ensures the availability of a wide range of fresh veggies. It is the world's second largest producer of vegetables, trailing only China. Vegetable farming has been practised in India since antiquity, and it has provided a good living for rural farmers. India is the home of many different types of vegetables and plays an important role in vegetable production. The cultivable land resource is reducing day by day as the population grows.

To fulfil the rising population's needs for food, fibre, fuel, fodder, and other commodities, agricultural land productivity and soil health must be enhanced.

Bottle gourd (*Lagenaria siceraria*) is a Cucurbitaceae plant that is also known as lauki, dudhi, or ghiya in India. Bottle gourd is a popular vegetable among Indians and has several health advantages. It contains the most choline of any vegetable, which serves as a precursor to the neurotransmitter acetylcholine, which is essential for memory retention and enhancement. [1]. There has been a recent movement in preferences towards consuming more fresh vegetables and related products, including beverages, as a result of increased health consciousness among individuals. The tri-terpenoid cucurbitacins B, D, G, and H as well as the bitter cucurbitaceae main component 22-deoxy-cucurbitacin are said to be present in the vegetable [2].

Bottle gourd juice has great therapeutic value, and the vegetable not only contains a wealth of protein, iron, and trace elements, but also has a high fibre content and other useful qualities. It is a decent source of vitamin C and a good source of vitamin B complex. [2]. The freshly extracted juice is an effective treatment for diabetes, epilepsy, stomach acidity, indigestion, ulcers, and other nervous illnesses [3]. It also helps people who have excessive thirst as a result of severe diarrhoea. Additionally, the fibre component aids in reducing piles and other digestive issues including gas.

Bottle gourd extracts have anti-inflammatory and anti-hyperlipidemic properties [4]. In several research model systems, fresh fruit juice has also shown antiulcer efficacy [5], hepatoprotective, free radical scavenging [6], immuno-modulatory, and cardio protective impact [7]. It has been demonstrated that this readily available vegetable helps people lose weight and is highly effective in treating jaundice and urinary issues.

In order to improve and maintain soil fertility for sustained crop productivity, all available organic, inorganic, and biotic resources must be optimised in an integrated manner that is appropriate to each cropping system and farming situation, with all of its ecological, social, and economic implications. This process is known as integrated nutrient management, or INM. Renewing interest in organic recycling has been seen throughout the world for sustainable crop production as a result of the recent energy crisis, price increases in chemical fertilizers as a result of the removal of government subsidies, and poor purchasing power of the farming community [8]. To encourage effective and balanced application of plant nutrients, it is necessary to implement an integrated supply and management system. While increasing the proper and balanced use of chemical fertilisers was the main focus, the use of organic manure, biofertilizers, green manuring, and the recycling of organic wastes should be seen as complementary rather than as a substitution.

Odisha's newly introduced crop demanded the rapid adoption of integrated nutrient management packages that combined chemical fertilisers with available locally organic sources. In light of this, a study was conducted to determine how the combined application of inorganic and organic manures affected bottle gourd yield and yield qualities.

## **MATERIAL AND METHOD**

The study was carried out at All India Co-ordinate Research project, (AICRP), College of Agriculture, Odisha University of Agricultural and technology (OUAT). The soil was sandy loamy in texture, low in available nitrogen ( $161.4 \text{ kg ha}^{-1}$ ) and medium in phosphorus ( $19.2 \text{ kg ha}^{-1}$ ) and potassium ( $332.4 \text{ kg ha}^{-1}$ ). A plot size of  $4 \times 4 \text{ m}^2$  was maintained and plants were spaced at  $1.5 \times 1.5 \text{ m}$  thereby keeping 8 plants per plot. There are twelve treatments and three replication. Treatment details are presented on Table 1. The cultivar Utkal Sobha was used for experiment. All standard package of practices for cultivation were followed for irrigation,

weeding and plant protection. All the characters studied like days to seed germination, vine length at the time of 30,60,75 DAS (cm), no. of branches at 30,60,75 DAS, leaf area (cm<sup>2</sup>), leaf length (cm), leaf width (cm), leaf weight (g), stem diameter (cm), no. of nodes on main vine , moisture % of fruit, dry matter % of fruit, fresh wt. of fruit ,dry wt. of fruit , no. of seeds per fruit yield per hectare (t ha<sup>-1</sup>), was subjected to statistical analysis using variance technique [9].

Treatment No.	Treatment details
T <sub>1</sub>	Absolute Control
T <sub>2</sub>	100% RDF (80:50:50kg ha <sup>-1</sup> )
T <sub>3</sub>	FYM @ 15 t ha <sup>-1</sup>
T <sub>4</sub>	VC @ 2.5 t ha <sup>-1</sup>
T <sub>5</sub>	50%RDF+ FYM@7.5 t/ha +BFs
T <sub>6</sub>	50%RDF+VC@2.5t/ha +BFs
T <sub>7</sub>	FYM@7.5t/ha +BFs
T <sub>8</sub>	50%RDF+BFs
T <sub>9</sub>	VC@7.5t/ha +BFs
T <sub>10</sub>	100%RDF+FYM@15t/ha +BFs
T <sub>11</sub>	100%RDF+VC@7.5t/ha+BFs
T <sub>12</sub>	50%RDF+ FYM@7.5t/ha+ VC@2.5t/ha +BFs

List 1 : List of treatments used for the study

## RESULTS AND DISCUSSION

### Vegetative growth parameters

The results obtained in respect to vegetative parameters like Days to seed germination, Vine length at 30, 60, 90 DAS, No. of branches at 30,60,90 DAS, Leaf area (cm<sup>2</sup>) at 30 DAP, Leaf length, leaf width, leaf weight (g), stem diameter (cm), number of nodes on main vine, treatment shown significant differences.

### Days to seed germination

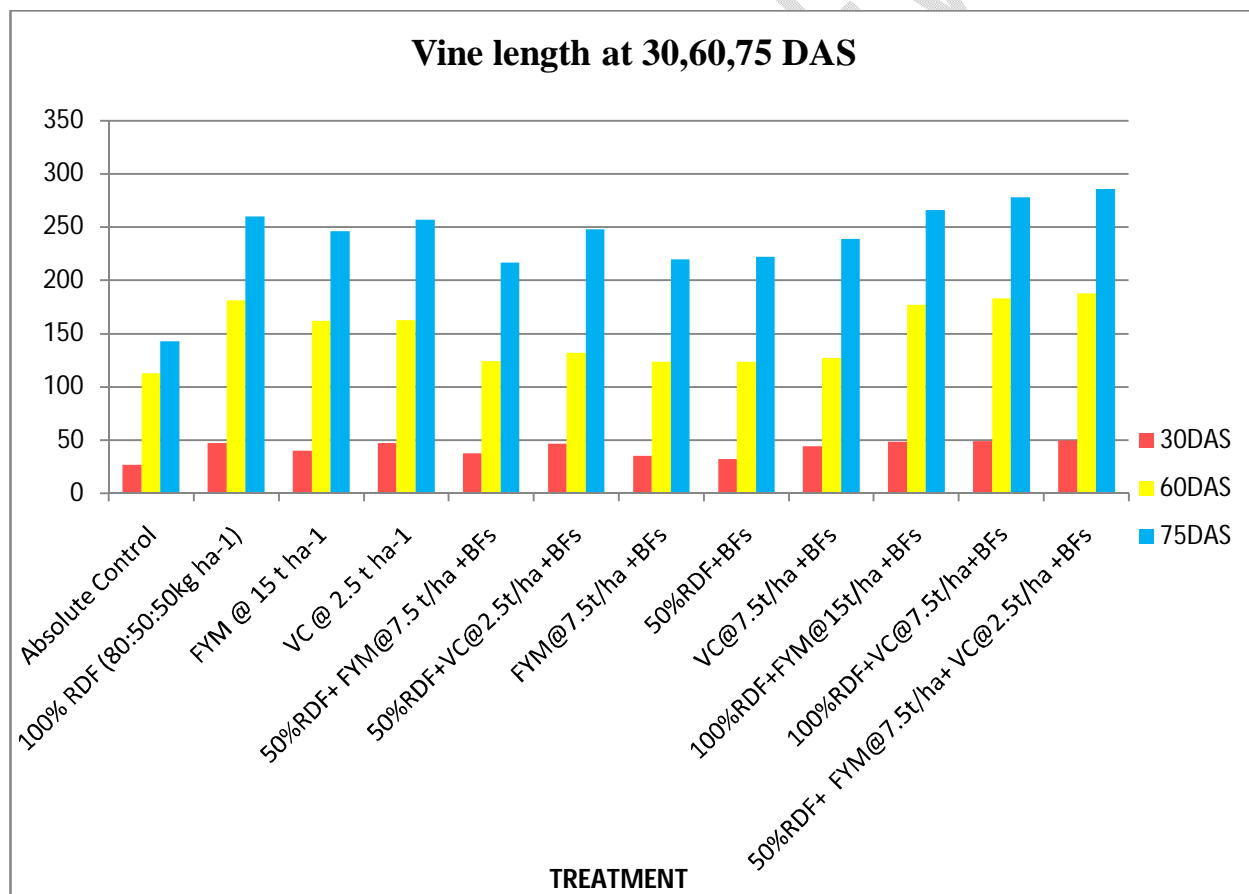
Data pertaining to the effect of organic manure and inorganic fertilizer on days required for germination of seeds of bottle gourd was found to be non significant which are presented in Table 1. Similar results have been reported by Mohmmad *et al.*, [10] Jan *et al.*, [11] in bottle gourd.

### Vine length at 30, 60, 90 DAS

The data on the growth in terms of main vine length at 30, 60, 75 DAS in bottle gourd as significantly influenced by application of organic manure and inorganic fertilizer levels are illustrated graphically in Fig.1 Among the significantly the maximum main vine length at 30 DAS (49.90cm) were with treatment T<sub>12</sub>, while, the minimum main vine length at 30 DAS (26.88) were obtained with treatment T<sub>1</sub> (Control) which was 4.35 per cent more than RDF. Significantly the maximum main vine length (187.70cm) at 60 DAS were obtained with treatment T<sub>12</sub>, while, the minimum main vine length (112.80cm) were observed in treatment

(control) which was 3.16 per cent more than RDF. Similarly, maximum main vine length at 75 DAS (283.53) were with treatment T<sub>12</sub>, while, the minimum main vine length at 90 DAS (285.95) were obtained with treatment T<sub>1</sub> Control which was 10.03 per cent more than RDF. Both chemical and organic fertilisers are essential for plant growth. The increased root systems of plants, which allowed them to absorb more water and nutrients from the soil and, in turn, improved various plant organs as well as the entire plant, may be to blame for the increase in vine growth. Both artificial and organic fertilisers are essential for plant growth.

The longer vines may be a result of the plants' better root systems, which allowed them to absorb more water and nutrients from the soil, improving various plant parts as well as the entire plant. Plant height is increased as a result of improved cell multiplication and cell elongation. The results presented above are highly consistent with those of Patil *et al.*[12] , Mohmmad *et al.* [13] and Jan *et al.*[14] in bottle gourd.



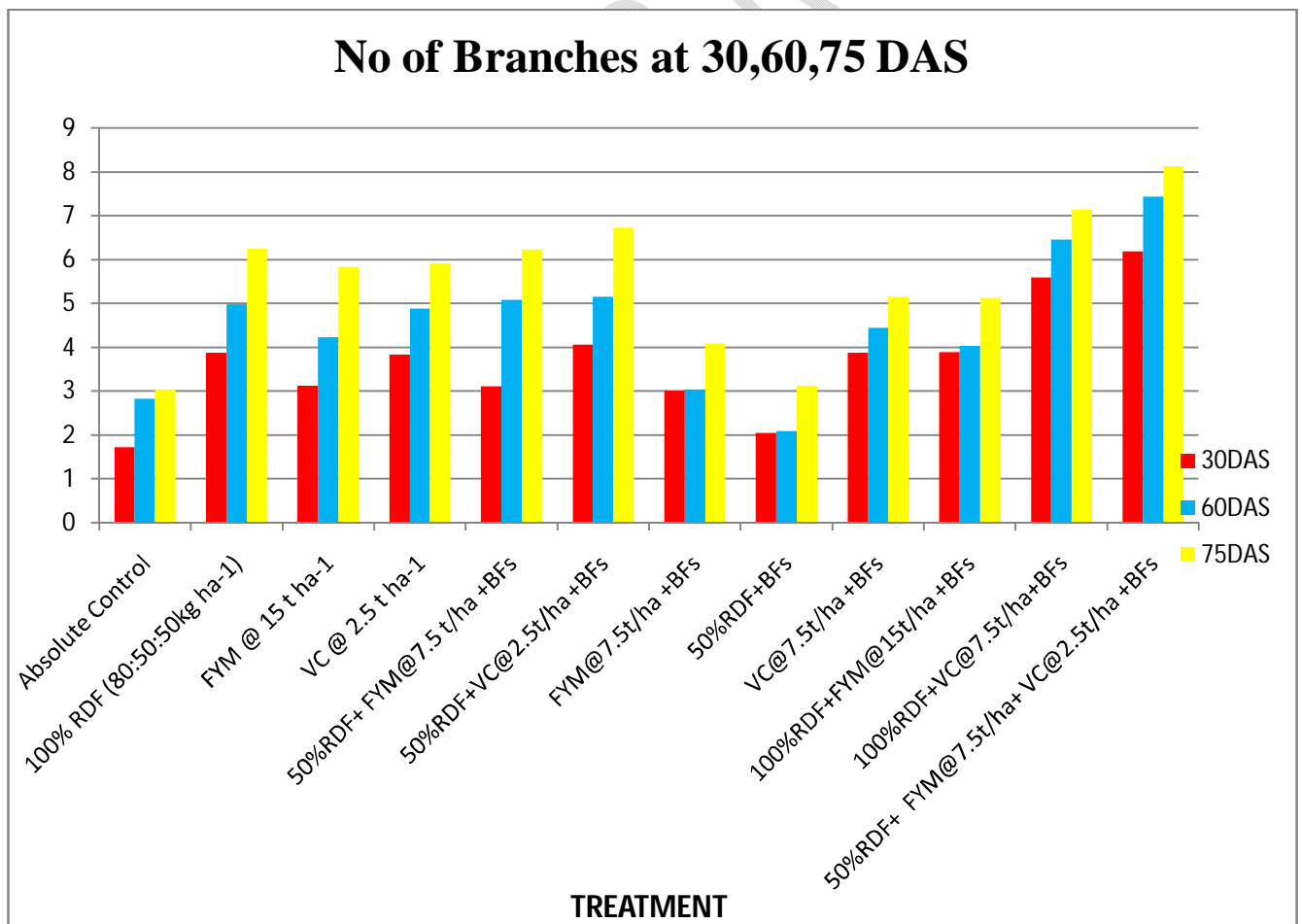
**Fig 1: Vine length at 30, 60, 75 DAS under the influence of integrated nutrient management**

**Number of branches from main vine**

The data on the growth in terms of number of branches from main vine at 30, 60, 90 DAS in bottle gourd as significantly influenced by application of organic manure and inorganic fertilizer levels are illustrated graphically in Fig.2

Number of branches from main vine increased significantly with increasing levels of organic manure and inorganic fertilizer significantly the maximum number of branches vine<sup>-1</sup> (6.18, 7.43, 8.12) at 30, 60, 75 DAS were obtained with treatment T<sub>12</sub> (50% RDF+ FYM@ 7.5 t ha<sup>-1</sup> + VC @ 2.5 t ha<sup>-1</sup> + BFs, while, the minimum number of branches per vine (1.72, 2.82,3.04) was observed in treatment T<sub>1</sub> (control).(Table).Treatment give (59.68, 49.19, 30.12 per cent more branches than RDF.

Increase in vine length and branches is readily known as nitrogen, which is an essential component of plant building material, boosted the length of the vine and the number of branches plant<sup>-1</sup>, as seen by the number of leaves yielded on each plant. These findings correspond with those of Rekha [14] for bitter gourd and selvakumar ans sekar [15] for cucumber.



## **Fig 2: No. of branches at 30, 60, 75 DAS under the influence of integrated nutrient management**

### **Leaf area (cm<sup>2</sup>) (30DAP)**

In terms of leaf area, treatment T<sub>12</sub> (50%RDF+FYM @7.5 t ha<sup>-1</sup>+VC @2.5t ha<sup>-1</sup>+BF) recorded maximum (547.93 cm<sup>2</sup>) leaf area, followed by T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub>, T<sub>8</sub>, T<sub>9</sub>, T<sub>10</sub>, T<sub>11</sub> where as minimum (429.00cm<sup>2</sup>) was recorded in treatment T<sub>1</sub> (Control). According to Hatwar *et al.* [16] the increase in leaf area resulted on by supplying plants with nutrients from various sources through organic, inorganic, and biofertilizer consortia may be the result of improved photosynthetic and other metabolic activities that result in an increase in the plant metabolites necessary for cell division and elongation. These outcomes support the findings of other researchers Narayanamma *et al.* [17] in bitter gourd and Rab and Haq [18] in tomato.

### **Leaf length (cm) and leaf width (cm)**

The data regarding the leaf length by the effect of different IPNM treatments are given in table.1.the maximum leaf length (22.87cm) was noted with T<sub>12</sub> (50%RDF+FYM@7.5t ha<sup>-1</sup>+VC @ 2.5 t ha<sup>-1</sup>+BF) followed by T<sub>2</sub>, T<sub>10</sub>, T<sub>11</sub>.The treatments T<sub>2</sub>, T<sub>10</sub>, T<sub>11</sub> are noted *statistically at par* with each other. The minimum leaf length (13.6cm) were noted under T<sub>1</sub> (control). Treatment T<sub>12</sub> give 4.14 per cent more leaf length (cm) than RDF. The data related to the leaf width as given in table....the maximum leaf width (21.76cm) were recorded under T<sub>12</sub> (50 %RDF + FYM @ 7.5t ha<sup>-1</sup>+VC @ 2.5 t ha<sup>-1</sup>+BF) .The treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>6</sub>, T<sub>10</sub>, T<sub>11</sub> are noted *statistically at par* with each other. The increase in the leaf length and leaf width might be due to simultaneous effect of availability of more nitrogenous compounds rate of photosynthesis which helps in the cell division and cell elongations of plants. The increase in the leaf size in the present experiment was due to the increase in the leaf length and leaf width by the availability of the more nitrogenous compounds through organic and inorganic sources and thereby there is increase in the leaf size. The present results are in conformity with the findings of Bhole *et al.* [19], Sharma and Singh [20], Kumar *et al.* [21]; Yuanxin *et al.* [22] and Kannan and Manivannan [23] .

### **Leaf weight (g) plant<sup>-1</sup>**

The leaf weights varied with each other by the application of different sources of nutrients. The data regarding the leaf weight are given in the table 1.The scanning of the data related to the leaf weight per plant varied significantly and noted maximum leaf weight (48.14g) under T<sub>12</sub> followed by T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>6</sub>, T<sub>10</sub>, T<sub>11</sub> which were *statistical parity* was observed. The maximum fresh weight of leaf in the present experiment might be due to the maximum leaf length and width under this treatment (T<sub>12</sub>). The present findings are in agreement with the findings of the Sharma *et al.* [24] and Sharma and Singh [25]. Kalyani *et al.* [26] and Prasad *et al.*[27]. The view of Bambal *et al.*[28] and Banger *et al.* [29] was that there is

more availability of nutrients like sulphur which helps in the utilization of the more nitrogenous elements by the plants.

### **Stem diameter**

As it is clearly evident from the above data related to stem diameter has placed under table 1. and vary significantly with each other. Data showed that maximum stem diameter (2.77) were recorded under T<sub>12</sub> (50% RDF+FYM @ 7.5t ha<sup>-1</sup>+VC @ 2.5 t ha<sup>-1</sup>+BF) and noted *at par* with the treatments T<sub>10</sub> and T<sub>11</sub>. The minimum stem diameter (0.73 cm) were noted under T<sub>1</sub>.

### **Number of nodes on main vine**

Perusal of data related to number of nodes on main vine (42.12) is presented in table-1. revealed that nutrient dynamics significantly influenced the number of nodes on main vine. Maximum number of nodes on main vine (42.12) were recorded with T<sub>12</sub> and noted *at par* with treatment T<sub>2</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>9</sub>, T<sub>10</sub>, T<sub>11</sub>. The minimum number of nodes were recorded under T<sub>1</sub> *i.e.* 28.15.

**Table1: Vegetative growth parameters under the influence of integrated nutrient management**

	<b>Treatments</b>	<b>Days to seed germination</b>	<b>Leaf area (cm<sup>2</sup>) (30DAP)</b>	<b>Leaf length (cm)</b>	<b>Leaf width (cm)</b>	<b>Leaf weight(g)</b>	<b>Stem diameter (cm)</b>	<b>Number of nodes on main vine</b>
<b>T<sub>1</sub></b>	<b>Absolute Control</b>	10.00	429.00	13.6	16.07	39.12	0.73	28.15
<b>T<sub>2</sub></b>	<b>100% RDF (80:50:50kg ha<sup>-1</sup>)</b>	7.00	501.76	21.96	19.82	46.37	1.92	41.67
<b>T<sub>3</sub></b>	<b>FYM @ 15 t ha<sup>-1</sup></b>	7.33	491.91	19.64	19.2	43.63	1.19	36.12
<b>T<sub>4</sub></b>	<b>VC @ 2.5 t ha<sup>-1</sup></b>	7.67	490.19	19.12	19.07	44.62	1.26	37.23
<b>T<sub>5</sub></b>	<b>50%RDF+ FYM@7.5 t/ha +BFs</b>	7.47	491.77	19.07	17.73	42.72	1.16	38.42
<b>T<sub>6</sub></b>	<b>50%RDF+VC@2.5t/ha +BFs</b>	7.67	488.76	18.94	18.6	43.12	1.12	39.65
<b>T<sub>7</sub></b>	<b>FYM@7.5t/ha +BFs</b>	7.8	482.85	18.05	17.57	41.76	1.43	35.75
<b>T<sub>8</sub></b>	<b>50%RDF+BFs</b>	7.45	478.93	16.89	17.53	40.05	0.95	35.50
<b>T<sub>9</sub></b>	<b>VC@7.5t/ha +BFs</b>	7.25	484.54	18.63	17.7	41.72	1.93	36.75
<b>T<sub>10</sub></b>	<b>100%RDF+FYM@15t/ha +BFs</b>	7.00	512.86	21.23	20.9	46.17	2.48	40.23
<b>T<sub>11</sub></b>	<b>100%RDF+VC@7.5t/ha+BFs</b>	7.00	508.93	22.17	20.03	47.17	2.56	41.13
<b>T<sub>12</sub></b>	<b>50%RDF+ FYM@7.5t/ha+ VC@2.5t/ha +BFs</b>	7.00	547.93	22.87	21.76	48.14	2.77	42.12
	<b>Mean</b>	7.55	492.45	19.35	18.83	43.72	1.62	37.73
	<b>SE(m)±</b>	0.37	28.85	0.85	1.08	1.80	0.08	1.98
	<b>CD (5%)</b>	NS	84.61	2.51	3.18	5.28	0.24	5.81

## Flowering parameters

### Node bearing 1<sup>st</sup> male flower and 1<sup>st</sup> female flower

Data regarding in the nodes to first male flower initiation is presented in fig. 3, it is evident from the present experiment that first nodes male flower initiation exhibited the significant response of different source of nutrients. The earliest male flowering node at 4.16 were recorded under T<sub>12</sub> (50% RDF + FYM @ 7.5 t ha<sup>-1</sup> + VC @ 2.5 t ha<sup>-1</sup> +BFs) followed by T<sub>11</sub> (100% RDF + VC @ 2.5t ha<sup>-1</sup> + BFs) and T<sub>2</sub> (100%RDF). The delay in initiation of nodes to first male flower was noted at 13.12 nodes in T<sub>1</sub> (Control). As graphically represented in fig. 3. reflects significant response with the effects of IPNM treatments. The first female flower was seen very early in the T<sub>12</sub> (7.03 nodes) than rest of the treatments. However, *statistical parity* were observed with treatments in T<sub>2</sub>, T<sub>10</sub> and T<sub>11</sub>. The maximum days seen by nodes under taken in the initiation first female flower 14.47 nodes under T<sub>1</sub> (Control). The view of Singh and Asrey [30] was that the increase is due to the fact that these nutrients are crucial components of proteins, chlorophyll, nucleotides, and enzymes involved in a variety of metabolic activities that directly affect the vegetative and reproductive phases of plants. Mangal and Kirkby [31] also agreed with the present findings.

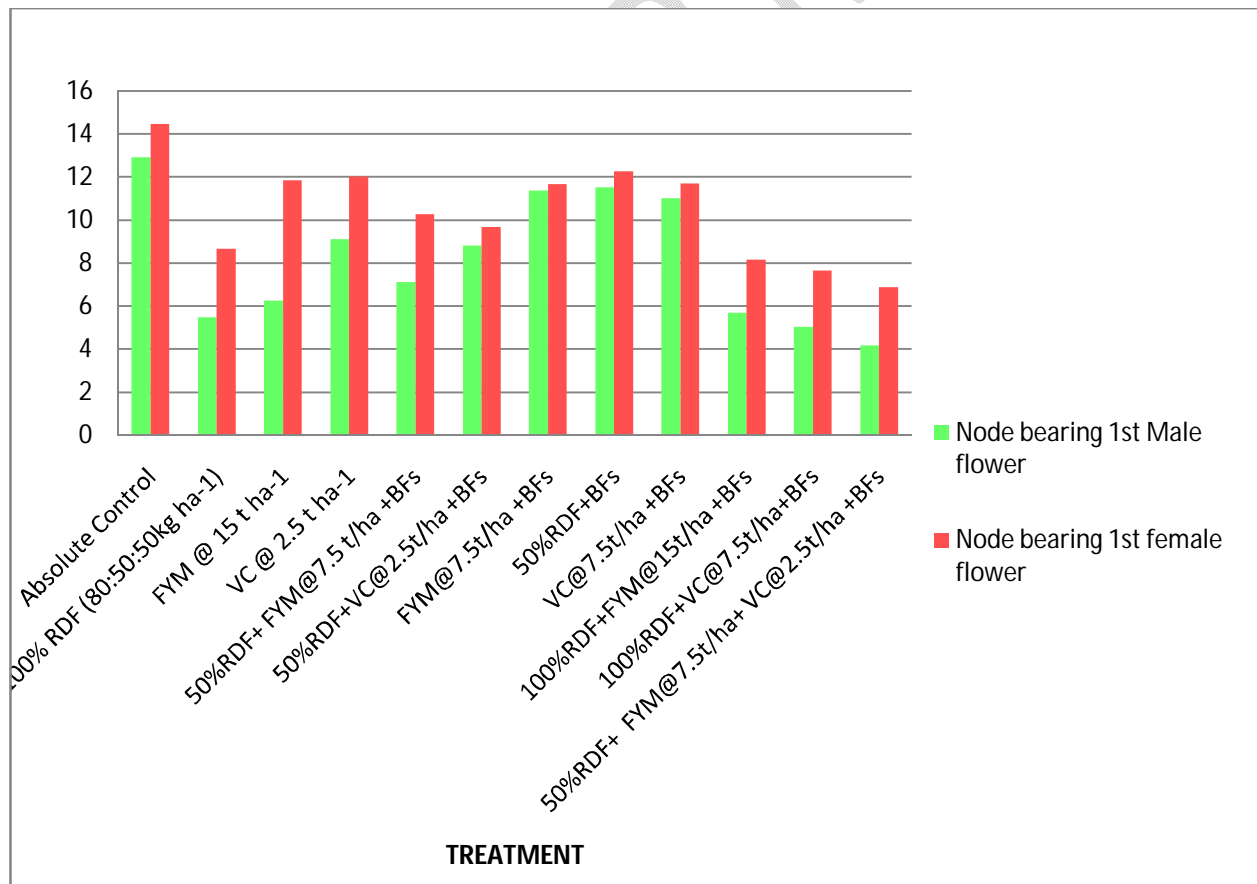


Fig 3: Node bearing 1<sup>st</sup> male and female flower under the influence of integrated nutrient management

## **Yield attributing parameters**

### **Moisture % of fruit**

The maximum moisture per cent (96.64) was obtained in bottle gourd fruit with the treatment T<sub>9</sub> (VC @ 7.5t ha<sup>-1</sup>), while minimum 95.50 per cent in treatment T<sub>1</sub> (Control). The data with regards to the moisture per cent of fruit as influenced by various IPNM treatments is presented in table- 2 showed that moisture per cent of fruit was non-significantly influenced by different treatments.

### **Dry matter % of fruit**

The minimum dry matter per cent (3.35) was obtained in bottle gourd fruit with the treatment T<sub>9</sub> (VC @ 7.5t ha<sup>-1</sup>), while maximum 4.50 per cent in treatment T<sub>1</sub> (Control). The data with regards to the dry matter per cent of fruit as influenced by various IPNM treatments is presented in table- 2 showed that dry matter per cent of fruit was non-significantly influenced by different treatments.

### **Fresh wt. and Dry wt. of fruit (g)**

The data presented on fresh weight of fruits as influenced by the various treatments has been presented in table-2. showed that average weight of fruit was significantly influenced by different treatments. The maximum average fruit weight was exhibited by treatment T<sub>12</sub> (50%RDF+ FYM @ 7.5t ha<sup>-1</sup>+ VC @ 2.5t ha<sup>-1</sup> +BFs) i.e., 1231g which was *statistically superior* over all the other treatments. The minimum fresh weight of fruit i.e. 587 g was recorded under treatment (T<sub>1</sub>). The data presented on dry weight of fruits as influenced by the various treatments has been presented in table-2 showed that average weight of fruit was significantly influenced by different treatments. The maximum average dry fruit weight was exhibited by treatment T<sub>12</sub> (50% RDF+ FYM @ 7.5 t ha<sup>-1</sup>+ VC @ 2.5 t ha<sup>-1</sup> +BFs) i.e., 48.75g which was *statistically superior* over all the other treatments. The minimum dry weight of fruit i.e. 26.42 g was recorded under control

Organic fertiliser application enhances the fresh and dry weight of fruits more than chemical fertiliser treatment. The higher efficacy of these treatments could be related to the availability of more nutrients, and their slow ease Vermicompost application resulted in a significant rise in fruit dry weight which may be attributable to the material being broken down by interactions between earthworms and microorganisms in a haemophilic process to produce organic soil amendments with low CN ratios. similar findings were also reported by Prajapati *et al.*[32].

### **No of seeds fruit<sup>-1</sup>**

The number of seeds fruit<sup>-1</sup> has also been significantly influenced among different treatments including control (Table 2.). Maximum number of seeds per fruit was recorded in T<sub>12</sub> (443) followed by T<sub>2</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub>, T<sub>9</sub>, T<sub>10</sub>, T<sub>11</sub> which were *statistically parity* was observed. The lowest number of seeds per fruit was recorded in T<sub>1</sub> (302).

### **Fruit Yield (t ha<sup>-1</sup>)**

The total yield of bottle gourd fruit as presented in table-2, showed that there was significant response of IPNM treatments toward increasing the fruit yield in bottle gourd. A careful examination of data on the total yield of bottle gourd fruit showed that the maximum yield of fruit 28.01 q ha<sup>-1</sup> was noted in T<sub>12</sub> (50% RDF+ FYM @ 7.5t ha<sup>-1</sup>+ VC @ 2.5t ha<sup>-1</sup> +BFs) which was *significantly superior* over all other treatments. The minimum fruit yield 7.40 q ha<sup>-1</sup> were obtained with (T<sub>1</sub>) Control. The data of both the years had shown the significant and superior response. Higher yield due to integrated nutrient management was reported earlier in pumpkin by Karuthamani *et al.* [33], Bindiya *et al.* [34] in cucumber, Nair [35] in bitter gourd, Mulani *et al.* [36] in bitter gourd and Karuppaiah and Balasankari [37] in snake gourd.

Organic manures (FYM/vermicompost) with RDF integration would have supplied appropriate macro and micronutrient specifications, creating a favourable environment for crop growth and development, and thereby yield (Anburai and Manivannan, 2002) [38].

The inoculation of microbial populations increases the efficacy of giving biologically fixed nitrogen, dissolved immobilised phosphorus, and phytoharmones to growing plants. Furthermore, they may boost nutrient absorption as well as the photosynthetic process, resulting in greater plant growth and productivity. Patton *et al.* [39].

### **Conclusion**

Integrated nutrient management treatments had significant impacts on almost all of the vegetative growth, yield attributing, and fruit quality measures of bottle gourd cv. Sobha Utkal. The treatment included 50% RDF + FYM @ 7.5 t ha+ VC @ 2.5 t ha-1 +BF. Consortia had the best results in practically all vegetative development, blooming, and yield characteristics. In terms of the results of the preceding characters, the control treatment, in which no nutrition was applied from outside, performed poorly.

So, keeping view on higher productivity, environment ecofriendly, balance nutrition to crops, maintenance of soil fertility, and economic condition of farmers it may be suggested that vegetable growers particularly Odisha may supplement 50% recommended dose of fertilizer with FYM and vermicompost along with biofertilizers *viz.* *Azotobacter*, *Azospirillum* and PSB (@ 4kg ha<sup>-1</sup>) each instead of applying full recommended dose of nitrogen from inorganic source in bottle gourd

**Table2: Yield attributing parameters under the influence of integrated nutrient management**

	Treatments	Moisture % of fruit	Dry matter % of fruit	Fresh wt. of fruit(g)	Dry wt. of fruit (g)	No of seeds fruit <sup>-1</sup>	Fruit Yield (t ha <sup>-1</sup> )
<b>T<sub>1</sub></b>	<b>Absolute Control</b>	95.50	4.50	587	26.42	302	7.40
<b>T<sub>2</sub></b>	<b>100% RDF (80:50:50kg ha<sup>-1</sup>)</b>	95.99	4.01	1020	40.90	429	20.90
<b>T<sub>3</sub></b>	<b>FYM @ 15 t ha<sup>-1</sup></b>	96.58	3.42	912	31.19	353	17.22
<b>T<sub>4</sub></b>	<b>VC @ 2.5 t ha<sup>-1</sup></b>	96.12	3.88	907	35.19	339	17.09
<b>T<sub>5</sub></b>	<b>50%RDF+ FYM@7.5 t ha<sup>-1</sup> +BFs</b>	95.99	4.01	990	39.69	419	17.72
<b>T<sub>6</sub></b>	<b>50%RDF+VC@2.5t/ha +BFs</b>	95.88	4.12	1000	41.20	423	19.52
<b>T<sub>7</sub></b>	<b>FYM@7.5t ha<sup>-1</sup> +BFs</b>	96.47	3.53	883	31.17	427	12.76
<b>T<sub>8</sub></b>	<b>50%RDF+BFs</b>	95.93	4.07	850	34.56	321	9.12
<b>T<sub>9</sub></b>	<b>VC@7.5t/ha +BFs</b>	96.64	3.36	900	30.24	425	16.33
<b>T<sub>10</sub></b>	<b>100%RDF+FYM@15t/ha +BFs</b>	96.19	3.81	1025	39.05	435	21.21
<b>T<sub>11</sub></b>	<b>100%RDF+VC@7.5t/ha +BFs</b>	96.13	3.87	1030	39.86	438	24.70
<b>T<sub>12</sub></b>	<b>50%RDF+ FYM@7.5t/ha+ VC@2.5t/ha +BFs</b>	96.04	3.96	1231	48.75	443	28.01
	<b>Mean</b>	96.12	3.88	944.58	36.52	<b>396.2</b>	17.66
	<b>SE(m)±</b>	0.62	0.62	42.59	1.52	22.83	0.79
	<b>CD (5%)</b>	NS	NS	124.89	4.47	66.95	2.32

## REFERENCES

1. Parle M and Kaur S, “ Is bottle gourd a natural gourd?,”International Research Journal Pharma.2011;2(6):13-17.
2. Shirwaikar A, and Sreenivasan KK,“Chemical investigation and antihepatotoxic activity of the fruits of *Lagenaria siceraria*,”Indian Journal Pharma Science.1996; 8:197-202.
3. Warriar PK, Nambiar VPK and Ramankutty C, *Lagenaria siceraria* (Mol.) Standley, *Indian Medicinal Plants*, Orient Longman Limited, Madras .1995; 3: 292-296.
4. Ghule V, Ghante MH, Saojia AN, and Yeole PG,“Hypolipidemic and antihyperlipidemic effects of *Lagenaria siceraria* (Mol.) fruit extracts,”. Indian Journal Experiment Biology.2006; 44:905-909 .
5. Joshi K, Patil KS, Rangari VD, and Sharma AK, Phytochemical investigation and antiulcer activity of *Lagenaria vulgaris*. In: Pharmacognosy Poster Presentation. *54th Indian Pharmaceutical Congress*.2002, P 213, Pune.
6. Deshpande JR, Mishra MR, Meghre VS, Wadodkar SG, and Dorle AK, “Free radical scavenging activity of *Lagenaria siceraria* (Mol.) Standley fruit,”Natural Product Research.2007; 6:127-130.
7. Deshpande JR, Choudhari AA, Mishra MR, Meghre VS, Wadodkar SG, and Dorle AK, “Beneficial effects of *Lagenaria siceraria* (Mol.) Standley fruit epicarp in animal models,”Indian Journal Experiment Biology.2008; 46: 234-242.
8. Pasricha NS, Singh Y, Singh B, Khind CS, Singh Y and Singh B. Integrated nutrient management for sustainable crop production. Journal Research Punjab Agrilcultural University.1996; 33(1-4) : 101-117.
9. Panse VG, Suhatme PV. Statistical methods for Agricultural Workers, 1967. ICAR, New Delhi.
10. Mohammad I, Ghafoor A, Wasseem K and Mohammad S. Effect of organic manures and biofertilizers on growth, yield and quality of bitter gourd (*Momordica charantia* L.) cv. Phule green gold. Journal Soils and Crops.2000;17(2):258-261.
11. Jan ND, Iqbal M, Ghafoo A, Waseem K and Jillani MS. Effect of NPK fertililizers and spacing on the yield of bottle gourd (*Lagenaria siceraria* M), Pakistan Journal of Biological Science.2000;3(3):448-489.
12. Patil SR, Desai UT, Pawar BG and Patil BT.1997. Effects of NPK doses on growth and yield of bottle gourd .Journal of Maharashtra Agricultural University.1997; 21(1):65-67.
13. Mohammad I, Ghafoofr A , Waseem K and Mohammad S.2000.Studied effect of NPK fertilizers and Spacing on the yield of bottle gourd. Pakistan Journal of Bio Science.2000;3 (3):448-449.

14. Rekha CR and Gopalkrishnan TR.2001. Studied effect of levels and frequencies of organic manures and inorganic fertilizers on growth and productivity of bitter gourd (*Momordica charantia* L.).South Indian Horticulture.2001;49:137-139.
15. Selvakumar S and Sekar K..Effect of graded levels of nitrogen on growth and yield of four varieties of cucumber (*Cucumis sativus* L.). South Indian Horticulture.2000; 48(1-6): 56-59.
16. Hatwar GP, Gondane SV, Urkude SM, Gahukar OV. Effect of micronutrients on growth and yield of chilli. Soil and Crop. 2003; 13:123-25.
17. Narayanamma M, Radha, Rani K, Kameswari, Lalitha P, Reddy RVSK. Effect of foliar application of micronutrients on the yield components, yield and nutrient content of bitter gourd. The Orissa Journal of Horticulture. 2009;37(2):207-209.
18. Rab A, Haq Ihsan-ul. Foliar application of calcium chloride and borax influences plant growth, yield and quality of tomato. (*Lycopersicon esculentum* Mill.) fruit. Turkey Journal Agriculture. 2012;36: 695-701.
19. Bhole SR, Bharad SG, Dod VN and Gholak SV.Effect of nitrogen and phosphorus on growth and yield of radish cv. Pusa Chetaki. Orissa Journal Horticulture.1998; 26(2):34-36.
20. Sharma SK and Singh H. Effect of seed rate and fertilizers doses on growth, yield and seed quality of pea (*Pisum sativum* L.) Arkel. Seed Research.2003; 31(1): 43-46.
21. Kumar M, Yadav K, Thakur SK and Mandal K. Effect of vesicular arbuscular mycorrhiza fungi and Rhizobium inoculation on nodulation, root development, nitrogen fixation and yield of chickpea. Indian Journal Soil Science.1998; 46(3): 375-378.
22. Yuanxin Li, Chenxinzhi GY and Li T. The effect of NPK mixed application on growth and yield of tomato in solar green house. Advances in Horticulture.1998; 2 (1): 403-407.
23. Kannan K and Manivannan K. Influence of Azospirillum, Phosphobacteria and Vesicular Arbuscular mycorrhiza on growth parameter of radish. Crop Research.2002;3(2): 138-141.
24. Sharma RP, Sharma A and Sharma JK . Productivity, nutrient uptake, soil fertility and economics as affected by chemical fertilizer and farm yard manure in broccoli (*Brassica oleracea* var italica) in an Eentisol. Indian Journal Agricultural Science.2005; 75(9): 576-579.
25. Sharma, S.K. and Singh, H. Effect of seed rate and NPK fertilizers on green pod production of pea cultivar Arkel. *Vegetable Science*.2002; 29(1): 96-98.
26. Kalyani DP, Ravishankar C and Prasad DM. Studies on the effect of nitrogen and Azospirillum on growth and yield of cauliflower. South Indian Horticulture.1996; 44 (5-6): 147-149.
27. Prasad VP, Srinivas S and Bhatt FN. Studies on Integrated Nutrient management on growth and yield of broccoli. International Seminar on Recent Trends Hi-Tech Hort. & PHT, Kanpur.2004.pp. 161-162.
28. Bambal AS, Verma RM, Panchbhai DM, Mahorka VK and Khankhane RN. Effect of biofertilizers and nitrogen levels on growth and yield of cauliflower (*Brassica oleracea* var. botrytis). Orissa Journal Horticulture.1998. 26(2): 14-17.

29. Bangar KS, Parmar BB, and Maini A. Effect of nitrogen and pressmud cake application on yield and uptake of NPK by Sugarcane. *Crop Research*. 2008; 19(2): 198-203.
30. Singh R and Asrey R 2005. Integrated nutrient management in tomato (*Solanum lycopersicum* L.) under semiarid region of Punjab. *Vegetable Science*.2005; 32(2): 194-195.
31. Mangal, K. and Kirkby, E. (1996). Principles of plant nutrition, Panima Publishing Corporation, New Delhi, India.1996; 4:147-149.
32. Prajapati VK, Swaroop N, Masih A, Lakra R. Effect of different dose of NPK and vermicompost on growth and yield attributes of Maize (*Zea mays* L.)Cv.MM2255. *Journal of Pharmacognosy and Phytochemistry*. 2018;7(1):2830-2832.
33. Karuthamani M, Natarajan S and Thaimburaj S. Effect of inorganic and bio-fertilizer on growth, flowering and yield of pumpkin (*Cucurbita moschata*) cv. CO2. *South Indian Horticulture*,.1995;49: 134-136.
34. Bindiya Y, Reddy IP, Srihari D, Reddy RS and Narayanamma M. 2006. Effect of different sources of nutrition on soil health, bacterial population and yield of cucumber. *Journal of Research A.N.G.R.A.U*. 2006; 34: 12-17.
35. Nair AK and Nair SA . Influence of FYM and nutrient on ridge and sponge gourd yield intercropped with coconut palm in South Andaman. *International Journal on Agricultural Science*.2006;2: 284– 285.
36. Mulani TG, Musmade AM, Kadu PP and MangoveK K. Effect of organic manures and biofertilizer on growth, yield and quality of bitter gourd (*Momordica charantia* L.) cv. Phule green gold. *Journal of soil and crops*.2007;17: 258–261
37. Karuppaiah P and Balasankari K. Effect of tillage system and nutrients on growth and yield of snake gourd and residual soil fertility under rice follow condition. *Asian Journal of Horticulture*.2008; 3: 70-73
38. Anburani A and Manivannan K. Effect of Integrated Nutrient Management on growth in brinjal (*Solanum melongena* L.)cv. Annamalai. *South Indian Horticulture*.2002; 50 (4-6): 377-386
39. Patton W, Serna A and Maiti CS. Effect of different levels of nitrogen and phosphorus on growth, flowering and yield of okra cv. Arka Anamika grown under the foothills of Nagaland. *Journal Horticulture science*.2002; 15(1): SI- 88