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## Efficacy of biostimulants on growth and flowering of *Dendrobium* orchid (*Dendrobium nobile* Lindl.) var. Sonia-17 under protected cultivation

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### Abstract

Studies on efficacy of biostimulants on growth and flowering of *Dendrobium* orchid var. Sonia - 17 under protected cultivation were carried out at farmers' field, Chapparamane during 2017-19. Eight biostimulants in two combinations were taken for the study and RDF was taken as control. The results revealed that among the biostimulant treatments, the treatment receiving Biovita (Brown sea weed extract) @ 1.5 per cent showed maximum plant height, number of leaves, leaf length, leaf width, leaf area, number of pseudobulbs, pseudobulb perimeter, days taken for bud initiation, days taken for spike emergence to first floret opening and final harvest compared to all other treatments and control (RDF).

**Keywords:** biostimulant, *Dendrobium* orchid, Biovita, sea weed extract

### Introduction

Orchids are flowers of exquisite beauty valued as cut flowers and pot plants in the floriculture trade. In the past couple of decades, they have occupied coveted position in the international flower market, evolving in to a multibillion dollar business. With the recent increase in world floriculture trade, orchids have become the second most popular plants as cut flowers as well as pot plants with an annual growth rate of 10-20 per cent (Sudeep *et al.*, 2018) [6].

At present, wide spread requirement for environment friendly agriculture for the production of quality flowers is in high demand. Efforts are underway for the sustainable way of crop production with organic fertilizers and biostimulants from natural resources to enhance the production of commercially important flower crops. The use of biostimulants, which has the capacity to beneficially modify plant growth, has grown dramatically over the past decade. Bio stimulants are the materials other than the fertilizers that promote the plant growth when applied in minute quantities and are also referred as 'metabolic enhancers'. They promote the plant growth besides improving yield and quality. Therefore, the present investigation was carried out to know the efficacy of biostimulants on growth and flowering of *Dendrobium* orchid var. Sonia - 17 under protected condition.

### Material and Methods

An experiment was undertaken under naturally ventilated polyhouse condition during 2017-19 at farmers' field, chapparamane, sirsi under K R C College of Horticulture, Arabhavi. Three month old healthy tissue cultured plants of var. Sonia - 17 were planted in orchid pots (earthen pots) and were placed on concrete benches. The experiment was laid out in Completely Randomized Design with seventeen treatments and two replications. Treatments included T<sub>1</sub> : Control (RDF - 30:10:10 @ 0.2% during vegetative stage and 10:20:20 @ 0.2% during flowering stage), T<sub>2</sub> - Humigrow (Humic acid) @ 1%, T<sub>3</sub> - Humigrow @ 1.5%, T<sub>4</sub> - Super growth (Fulvic acid) @ 1%, T<sub>5</sub> - Fulvic acid @ 1.5%, T<sub>6</sub> - Biovita ( Sea Weed Extract) @ 1%, T<sub>7</sub> - Biovita @ 1.5%, T<sub>8</sub> - Spic cytozyme (GA<sub>3</sub> 0.001%) @ 0.3%, T<sub>9</sub> - Spic cytozyme @ 0.5%, T<sub>10</sub> - Isabion @ 1%, T<sub>11</sub> - Isabion @ 1.5%, T<sub>12</sub> - Boom flower (Nitro benzene) @ 1%, T<sub>13</sub> - Boom flower @ 1.5%, T<sub>14</sub> - Formula 15 (Humic Acid + Fulvic Acid + Amino acid) @1%, T<sub>15</sub> - Formula 15 @ 1.5%, T<sub>16</sub> - Humicel plus (Humic Acid + Fulvic Acid+ Sea Weed Extract) @ 1%, T<sub>17</sub> - Humicel plus @ 1.5%. RDF and biostimulants were applied as a foliar spray at weekly intervals. The growth parameters were recorded using five random plants at peak growth stage (15 months after planting).

## Result and Discussion

The data pertaining to growth and flowering parameters are presented in Table 1-2. All the parameters varied significantly by the foliar application of biostimulants. Among the different biostimulants studied Biovita @ 1.5 per cent (extract of *Ascophyllum nodosum*- a brown sea weed) recorded maximum plant height (38.05 cm), number of leaves (18.89), leaf length (14.24 cm), leaf width (4.15 cm) and leaf area (770.73 cm<sup>2</sup>) which was statistically on par with Humicel plus @ 1.5 per cent (37.35 cm, 18.25, 14.00 cm and 4.00 cm, respectively). The increased growth in Biovita (sea weed extract) applied treatments was probably due to presence of cytokinin and auxin precursors, macro and micronutrients which increase the cell division, cell enlargement with better utilization of chemical fertilizers resulting in rapid vegetative growth. Auxin and cytokinin also directly influence plant architecture by controlling formation, maintenance and growth of apical and axillary meristems of shoots. The results are supported by the findings of Poincelot (1994) [4] in cosmos, Dhutraaj *et al.* (2003) [2] in gaillardia, Karuppaiah and Sendhilnathan (2011) [3] in orchid, Vivian *et al.* (2014) [8] in marigold, Violeta *et al.* (2010) [7] and Pruthvi *et al.* (2017) [5] in chrysanthemum.

With respect to number of pseudobulbs and pseudobulb perimeter, significant results were obtained in foliar application of Biovita @ 1.5 per cent and was found to be

statistically on par with Humicel plus @ 1.5 per cent. The increased number of pseudobulbs and pseudobulb perimeter was due to the fact that, humic and fulvic acid enhance organic carbon content uptake by the plant and sea weed extract mainly contains amino acids like betaines and sterols which enhance the photosynthetic activity, nitrogen metabolism and protein synthesis and also growth regulators especially Auxin and Cytokinin which are responsible for faster cell division and cell enlargement and thereby promotes the development of pseudobulbs (Karuppaiah and Sendhilnathan, 2011 in orchid) [3].

Floral characters include days taken for bud initiation, days taken for spike emergence to first floret opening and days taken for first floret opening to harvest. Bud initiation from the date of planting was significantly enhanced by biostimulant treatments. It was more pronounced in the treatment Biovita @ 1.5 per cent which enhanced the spike initiation process by 53 days than control (RDF alone) (Table 2). The same treatment took least number of days for spike emergence to first floret opening and for first floret opening to harvest. The earliness in floral characters might be due to sea weed extract treatment which stimulated the production of florigin and other flower inducing substances in the plants, which might have resulted in earliness of flowering. These results are corroborated with the findings of Anitha and Kannan (2015) [1] in *Dendrobium* orchid.

**Table 1a:** Efficacy of biostimulants on growth of *Dendrobium* orchid var. Sonia-17 under protected cultivation

Treatment	Plant height (cm)	Number of leaves	Leaf length (cm)	Leaf width (cm)	Leaf area per plant (cm <sup>2</sup> )
T <sub>1</sub> - Control (RDF)	29.95	14.80	11.13	3.35	431.18
T <sub>2</sub> - Humigrow @ 1%	32.20	16.10	12.10	3.53	536.14
T <sub>3</sub> - Humigrow @ 1.5%	34.00	17.45	12.93	3.69	605.68
T <sub>4</sub> - Super growth @ 1%	33.85	16.95	12.50	3.65	600.49
T <sub>5</sub> - Super growth @ 1.5%	35.95	17.98	13.00	3.76	668.39
T <sub>6</sub> - Biovita @ 1%	35.24	17.25	13.25	3.86	691.25
T <sub>7</sub> - Biovita @ 1.5%	38.05	18.89	14.24	4.15	770.73
T <sub>8</sub> - Spic cytozyme @ 0.3%	31.10	15.88	11.38	3.58	519.75
T <sub>9</sub> - Spic cytozyme @ 0.5%	32.95	16.90	12.30	3.68	571.80
T <sub>10</sub> - Isabion @ 1%	30.05	15.64	11.25	3.40	495.33
T <sub>11</sub> - Isabion @ 1.5%	31.60	16.49	12.19	3.55	549.89
T <sub>12</sub> - Boom flower @ 1%	30.75	15.75	11.25	3.37	507.75
T <sub>13</sub> - Boom flower @ 1.5%	32.65	16.82	12.25	3.53	558.69
T <sub>14</sub> - Formula 15 @ 1%	34.10	16.94	12.45	3.60	613.77
T <sub>15</sub> - Formula 15 @ 1.5%	35.90	17.63	13.17	3.72	683.24
T <sub>16</sub> - Humicel plus @ 1%	35.30	17.15	13.23	3.79	667.70
T <sub>17</sub> - Humicel plus @ 1.5%	37.35	18.25	14.00	4.00	732.99
S.Em ±	0.44	0.25	0.23	0.06	7.81
C.D. (5%)	1.34	0.76	0.70	0.18	23.44

Note\* RDF is common for all treatments

RDF: 30:10:10 NPK @ 0.2% at vegetative stage

10:20:20 NPK @ 0.2% at flowering stage

**Table 1b:** Efficacy of biostimulants on number of pseudobulbs and pseudobulb perimeter in *Dendrobium* orchid var. Sonia-17 under protected cultivation

Treatment	Number of pseudobulbs	Perimeter of the pseudobulb (cm)
T <sub>1</sub> - Control (RDF)	4.06	3.58
T <sub>2</sub> - Humigrow @ 1%	4.22	3.95
T <sub>3</sub> - Humigrow @ 1.5%	5.05	4.47
T <sub>4</sub> - Super growth @ 1%	4.25	4.41
T <sub>5</sub> - Super growth @ 1.5%	4.45	4.80
T <sub>6</sub> - Biovita @ 1%	4.50	4.63
T <sub>7</sub> - Biovita @ 1.5%	5.05	5.07
T <sub>8</sub> - Spic cytozyme @ 0.3%	4.15	3.83
T <sub>9</sub> - Spic cytozyme @ 0.5%	4.35	4.12
T <sub>10</sub> - Isabion @ 1%	4.10	3.53

T <sub>11</sub> - Isabion @ 1.5%	4.31	3.64
T <sub>12</sub> - Boom flower @ 1%	4.10	3.66
T <sub>13</sub> - Boom flower @ 1.5%	4.25	4.03
T <sub>14</sub> - Formula 15 @ 1%	4.27	4.07
T <sub>15</sub> - Formula 15 @ 1.5%	4.39	4.45
T <sub>16</sub> - Humicel plus @ 1%	4.44	4.57
T <sub>17</sub> - Humicel plus @ 1.5%	4.85	4.90
S.Em ±	0.10	0.04
C.D. (5%)	0.29	0.14

Note\* RDF is common for all treatments

RDF: 30:10:10 NPK @ 0.2% at vegetative stage

10:20:20 NPK @ 0.2% at flowering stage

**Table 2:** Efficacy of biostimulants on flowering parameters of *Dendrobium* orchid var. Sonia-17 under protected cultivation

Treatment	Days taken for bud initiation	Days taken from spike emergence to first fiolet opening	Days taken from first fiolet opening to final harvest
T <sub>1</sub> - Control (RDF)	216.00	32.78	26.00
T <sub>2</sub> - Humigrow @ 1%	200.55	31.84	23.81
T <sub>3</sub> - Humigrow @ 1.5%	187.60	30.98	23.51
T <sub>4</sub> - Super growth @ 1%	188.55	30.99	23.74
T <sub>5</sub> - Super growth @ 1.5%	178.62	29.33	22.36
T <sub>6</sub> - Biovita @ 1%	174.46	29.45	22.49
T <sub>7</sub> - Biovita @ 1.5%	162.93	27.88	21.31
T <sub>8</sub> - Spic cytozyme @ 0.3%	191.83	31.28	23.76
T <sub>9</sub> - Spic cytozyme @ 0.5%	186.26	30.34	22.77
T <sub>10</sub> - Isabion @ 1%	205.99	32.62	25.27
T <sub>11</sub> - Isabion @ 1.5%	200.13	31.97	24.31
T <sub>12</sub> - Boom flower @ 1%	189.60	31.17	23.60
T <sub>13</sub> - Boom flower @ 1.5%	181.86	30.12	22.64
T <sub>14</sub> - Formula 15 @ 1%	192.89	31.67	23.53
T <sub>15</sub> - Formula 15 @ 1.5%	186.14	30.00	22.65
T <sub>16</sub> - Humicel plus @ 1%	179.15	29.97	23.06
T <sub>17</sub> - Humicel plus @ 1.5%	172.11	28.07	22.04
S.Em ±	2.68	0.33	0.18
C.D. (5%)	8.06	0.99	0.55

Note\* RDF is common for all treatments

RDF: 30:10:10 NPK @ 0.2% at vegetative stage

10:20:20 NPK @ 0.2% at flowering stage

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