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Namita N Aind

Department of Horticulture,
Naini Agriculture Institute,
Sam Higgingbottom University
of Agriculture, Technology and
Sciences, Allahabad, Prayagraj,
Uttar Pradesh, India

Samir E Topno

Department of Horticulture,
Naini Agriculture Institute,
Sam Higgingbottom University
of Agriculture, Technology and
Sciences, Allahabad, Prayagraj,
Uttar Pradesh, India

SS Saravanan

Department of Horticulture,
Naini Agriculture Institute,
Sam Higgingbottom University
of Agriculture, Technology and
Sciences, Allahabad, Prayagraj,
Uttar Pradesh, India

Non-destructive and rapid estimation of chlorophyll content of chrysanthemum using SPAD-502 at different levels of nitrogen application on flower yield

Namita N Aind, Samir E Topno and SS Saravanan

Abstract

An investigation was carried out to determine the chlorophyll content in chrysanthemum (*Dendranthema grandiflora*) by using SPAD-502 at different level of nitrogen applications in the department of horticulture, Sam Higgingbottom University of Agriculture Technology and Sciences, Prayagraj, (U.P), India, during the winter season 2019. Different level of nitrogen fertilizers were taken as treatments and are applied at an interval of thirty days and chlorophyll content were determined at interval of 15 days. The main objective of this study is to assess the chlorophyll content in response to different level of nitrogen, to evaluate the photosynthetic rate with different levels of nitrogen application and to determine leaf N with different level of N applications in chrysanthemum.

Keywords: Chrysanthemum, nitrogen, soil plant analysis device, plant height, number of flower, flower yield, chlorophyll content

Introduction

Material and methods

The experiment was conducted is randomized block design (RBD) with 10 treatments with 3 replications. Seedlings were planted in Horticulture research farm of department of horticulture, Sam Higgingbottom, University of Agriculture, Technology and Sciences, Prayagraj during September 2019 to February 2020. Total number of treatments were 10 viz. T₀ (2255ppm), T₁ (2260ppm), T₂ (2270ppm), T₃ (2275ppm), T₄ (2280ppm), T₅ (2285ppm), T₆ (2290ppm), T₇ (2295ppm), T₈ (2300ppm), T₉ (2305ppm).

Climatic conditions in Experimental site

The area of Prayagraj district comes under subtropical belt in the South East of Uttar Pradesh, which experiences extremely hot summer and fairly cold winter. The maximum temperature of the location reaches unto 46⁰C-48⁰C and seldom falls as low as 4⁰C -5⁰C. There relative humidity range between 20 to 94%. The average rainfall in this area is around 103.4mm annually with maximum concentration during July to September with few showers and drizzles in winter also.

Results and discussion

The present study on "Non-destructive and rapid estimation of chlorophyll content in chrysanthemum using SPAD-502 at different levels of nitrogen application on flower yield" was laid out at Horticulture experimental field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) during 2019-2020. In the experiment 10 treatments were tried which were replicated 3 times and experimental design used was Factorial Randomized block Design (RBD). The maximum and minimum findings in this investigation and conclusion drawn are summarized below.

The results of present investigation are summarized below

Chlorophyll content

The treatment T₈ (2295 PPM) recorded maximum chlorophyll content (32.03, 34.70, 40.50, 48.25, 53.56, 52.26 SPAD UNIT) at 15, 30, 45, 60, 75 and 90 days respectively whereas T₀(control) has minimum chlorophyll content (19.66, 24.66, 33.42, 32.63, 38.60, 38.00 SPAD UNIT) at 15, 30, 45, 60, 75 and 90 days respectively.

Corresponding Author:**Namita N Aind**

Department of Horticulture,
Naini Agriculture Institute,
Sam Higgingbottom University
of Agriculture, Technology and
Sciences, Allahabad, Prayagraj,
Uttar Pradesh, India

Growth Parameters

In terms of plant height treatment T₈ (2295 PPM) recorded maximum (10.62, 29.80, and 38.65cm) plant height at 30, 60 and 90 days respectively followed by T₉(2300 PPM) with (8.78, 27.12, 37.52cm) at 30, 60 and 90 days respectively,

In terms of Number of branches treatment T₈ (2295 PPM) recorded maximum (2.18, 6.21, and 15.38) number of branches at 30, 60 and 90 days respectively followed by T₉(2300 PPM) with (2.15, 5.58, 14.92) number of branches at 30, 60 and 90 days respectively.

In terms of no. of leaves treatment T₈(2295 PPM) recorded maximum (11.67, 33.91 and 57.98) no of leaves at 30, 60 and 90 days respectively

In terms of plant spread treatment T₈ recorded maximum (5.75, 19.45, and 26.22 cm) plant spread at 30, 60 and 90 days respectively followed by T₉ (300 PPM) with (5.62, 17.10, 26.23) plant spread at 30, 60 and 90 days respectively, where

as minimum plant spread (4.00, 13.12, 19.20) was recorded in treatment T₀ (control) at 30, 60,90 days respectively

Floral Parameter

In terms of days of first flower bud emergence treatment T₈ recorded early (43.86 days) for the first bud emergence followed by T₉ (46.95 days) where as maximum days for first bud emergence (61.50 days) was recorded in treatment T₀(control).

Yield Parameter

In terms of yield of flower/plant treatment T₈ recorded maximum (406.16g) flower yield/plant followed by T₉ with (390.15g) flower yield/plant, where as minimum flower yield /plant (156.65g) flower yield /plants was recorded in treatment T₀ (control).

Table 1: Non-destructive and rapid estimation of chlorophyll content of chrysanthemum using SPAD-502 at different levels of Nitrogen application on flower yield.

Treatment symbol	Treatment (ppm)	Plant height (cm)	Plant Spread (cm ²)	No. of branches/plant	No. of leaves per plant	No. of days required for first bud emergence	No. of days for first flower opening	No. of flower per plant
T ₀	2255	25.65	19.20	6.42	38.39	61.58	91.25	53.36
T ₁	2260	30.29	20.20	7.40	46.87	50.04	86.16	72.80
T ₂	2270	30.42	25.22	5.25	49.76	48.72	88.83	63.35
T ₃	2275	31.28	24.15	8.55	50.12	47.23	86.17	65.91
T ₄	2280	32.46	21.17	8.45	51.62	46.97	77.59	82.36
T ₅	2285	33.12	26.22	9.30	50.22	49.91	83.86	68.00
T ₆	2290	33.81	25.02	9.47	53.02	51.08	84.38	70.84
T ₇	2295	35.23	26.12	12.42	50.67	48.92	80.01	80.37
T ₈	2300	38.65	26.22	15.38	57.98	43.92	77.59	87.14
T ₉	2305	37.52	26.21	14.92	55.27	45.86	76.67	84.92
S.Ed(±)		3.320	1.489	2.467	1.881	3.20	4.686	10.986
C.D@5%		6.929	7.146	5.150	3.925	7.99	9.780	22.930
Result		S	S	S	S	S	S	S

Graphical representation of table 1

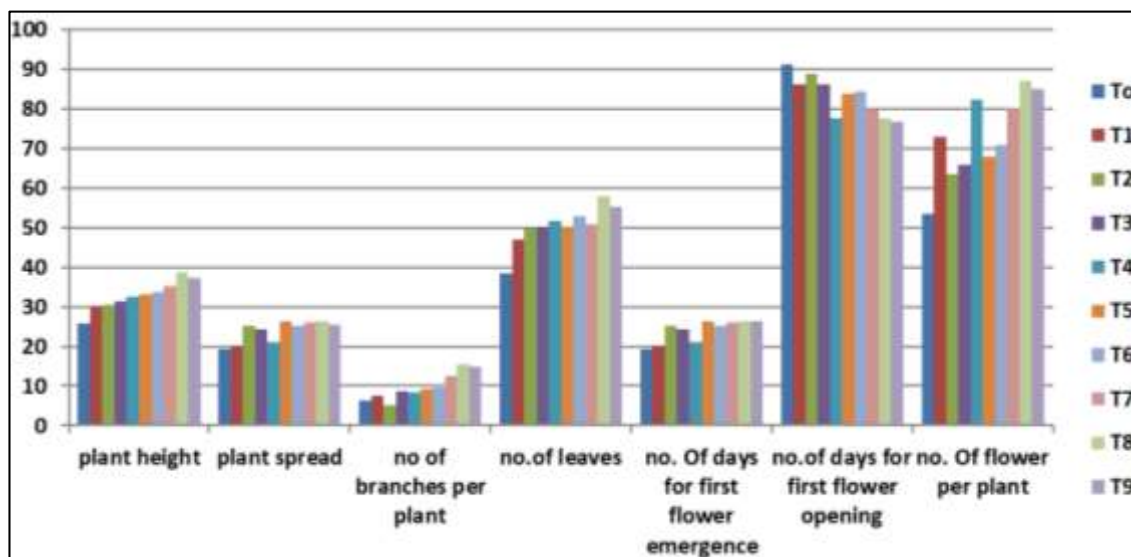
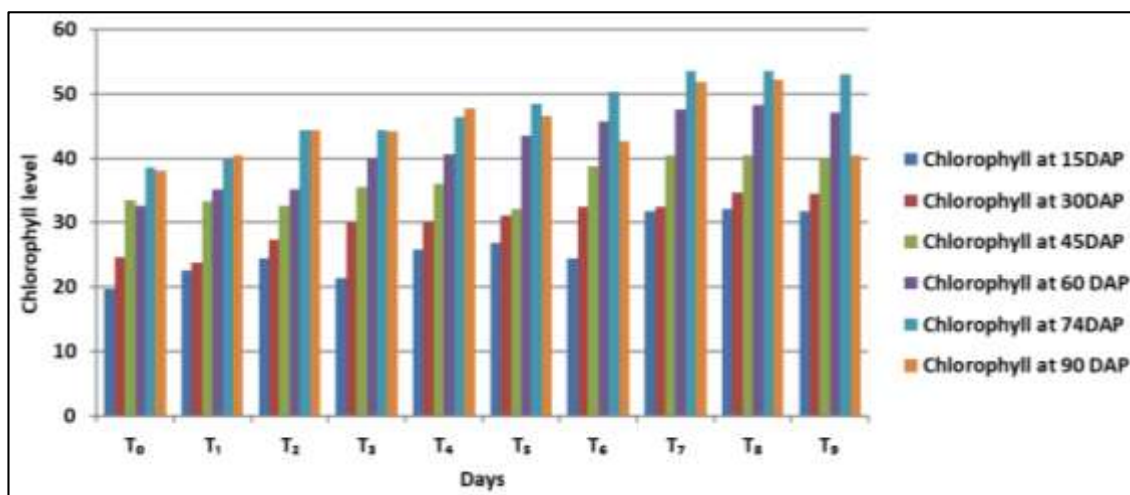


Fig 1: Depict the effect of different nitrogen levels on Chrysanthemum (*Dendranthema grandiflora*)

Table 2. Effect of different levels of nitrogen fertilizers on chlorophyll of chrysanthemum (*Dendranthema grandiflora*).

Symbol	Chlorophyll content (spad unit)					
	15 DAP	30DAP	45DAP	60DAP	75DAP	90DAP
T ₀	19.66	24.66	33.42	32.63	38.60	38.00
T ₁	22.50	23.83	33.30	35.23	39.80	40.36
T ₂	24.40	27.40	32.53	35.19	44.32	44.32
T ₃	21.40	30.13	35.50	40.16	44.32	44.16
T ₄	25.73	30.16	36.03	40.60	46.33	47.76
T ₅	26.90	31.16	32.16	43.56	48.45	46.53
T ₆	24.40	32.15	38.66	45.66	50.33	42.66
T ₇	31.40	32.43	39.93	47.16	49.72	50.52
T ₈	32.03	34.70	40.50	48.25	53.56	52.26
T ₉	31.73	34.36	38.93	47.66	50.56	40.52

Graphical representation of table 2.**Fig 2:** Depict the effect of different nitrogen levels on chlorophyll content (SPAD unit) of Chrysanthemum leaves (*Dendranthema grandiflora*)**Conclusion**

Based on the present findings of the experiment, it is concluded that treatment T₈ (2295 PPM) was found to be best and T₀ (control) recorded the minimum in terms of chlorophyll content. And in case of plant growth and flower yield treatment T₈ with application of (2295PPM Nitrogen) recorded maximum growth and yield.

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