EFFECT OF FOLIAR APPLICATION OF GROWTH REGULATORS (INDOLES) ON CHLOROPHYLL CONTENT IN PEA (*PISUM SATIVUM (L)*.

Namita Sharma*, Suruchi Tyagi and Manju Nagar

Department of Botany, M.M.H. College, Ghaziabad

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Abstract: A field experiment was conducted to study the effect of foliar spray of growth regulators on chlorophyll content of *Pisum sativum(L).* The treatments of IAA (Indole acetic acid) and IBA (Indole butyric acid) in combination were used at different concentrations viz. 25ppm, 50ppm and 100ppm with control. It was observed that chlorophyll content inhibited at all treatments during early stage of crop growth. Combinations of Indoles of high concentration (IAA+ IBA 100ppm) increase the chlorophyll content while their low concentration IAA + IBA (25ppm) decrease the effect of chlorophyll content at 90 days stage of crop growth as compared to control. The chl. 'a', chl. 'b'and protochlorophyll become highest in (IAA + IBA 100ppm) T_4 at 90 days stage of crop growth.

Keywords: *Pisum sativum*, Growth regulators, IAA, IBA, Chlorophyll content

INTRODUCTION

Pisum sativum (L) (Pea) belongs to the family fabaceae is used as a vegetable and rich source of carbohydrate, protein, iron, calcium, phosphorus and vitamins i.e. A, B and C (Watt and merril 1963, Hassan (1997). It is a popular legume vegetable crops grown in Egypt and many countries all over the world Gad et.al., (2012). Plant growth regulators (Indoles) are the chemical which enhance the growth when applied in very minute quantity (Naeem et al. 2004). The invention of plant growth regulators is an outstanding achievement which has contributed a good deal in the process of agriculture. It is well known that hormonal treatment is effective for growth, yield and physiological aspects. A lot of work has been done on the chlorophyll content of various plants (melihe Gemici et.al., (2000) in *Lycopersicum esculentum mill*., Ramesh et.al., (2005) in Barley Mutant, Paul et.al., (2006) in *Rauvolfia Serpentina* and kokare et.al., (2006) in *Abelmoschus esculentum(L).* Prakash (1998) in *Artocarpus heterophyllus* chl 'a' and chl 'b' increased in IAA (100ppm), sharma et. al., (1988) observed that chlorophyll content viz chl. 'a', chl. 'b' and protochlorophyll were greately reduced due to the UV exposures so it was desired to investigate certain physiological parameters in relation to the PGRs. So in this study, effect of PGRs (Indoles) on chlorophyll content during crop growth was taken.

MATERIAL AND METHOD

The experiment was conducted during 2010-2011 at Botanical garden, Department of Botany, Govt P. G. Collage Noida. Seeds of *Pisum sativum (L)* were sown in a well prepared experimental plot in the Botanical garden. The experiment consist of 4 treatments of foliar application of growth regulators viz T_1 (Control), T_2 (IAA + IBA 25ppm), T_3 (IAA + IBA 50ppm) and T_4 (IAA + IBA 100ppm) applied after seed emergence. The samples for chlorophyll analysis during crop growth taken regularly at 15 days intervals after the seeding emergence till maturity of the crop.

250 mg fresh leaves were homogenized with 80% acetone and centrifuged at 4000 rpm for 5 minutes. Filtrate was taken out and final 10 ml volume was made by using 80% acetone. Optical Density (OD) was read at 626, 645 and 663 nm with the help of Systronics 105 spectrophotometer. The chlorophyll content was estimated by the formulae given by Koski and Smith, (1948) which are expressed below:

Chl. a, mg/gm = 12.67(A663) – 2.65(A645) - 0.29 (A626)
Chl. b, mg/gm = 23.60(A645) – 4.23 (A663) – 0.33(A626)
Protochl. mg/gm = 29.60 (A626) -2.99(A663) – 6.75 (A645)

RESULT AND DISCUSSION

In the present study the data given in table 1 and figure (1-3) showed that treatments T_2, T_3 and T_4 caused a marked decline in different chlorophyll pigment viz chl.'a', chl. 'b' and protochlorophyll at 15 days stage of crop growth. The inhibition of chlorophyll pigment starts from T_2 treatment and it was observed 4%, 27% and 57% at T_2 treatment and 42%, 70% and 97% at T_3 treatment and 1%, 15% and 21% at T_4 treatment in chl. 'a', chl. 'b' and protochlorophyll respectively. At 30 days stage, inhibition was observed 32%, 29% and 17% at T2 and 1%, 28% and 53% at T3 treatment in chl. 'a', chl. 'b' and protochlorophyll respectively. Inhibition in chl. 'a' and chl. 'b' was observed 24% and 15% at T_2 and T_3 treatment. However promotion was observed 12% in protochloropyll at T_4 treatment. At 45 days, promotion was observed 28% and 7% in chl. 'a' and chl. 'b' however inhibition was observed 13% in protochlorophyll at T_2 treatment. Promotion

*Corresponding Author

was observed 43%, 39% and 28% at T_3 and 28%, 42% and 58% at T4 treatment in chl. 'a', chl. 'b'and protochlorophyll respectively At 60 days stage, chl. 'a' was inhibited 21% at T_3 treatment however promoted 5% at T_2 and 2% at T_4 treatment. Chl. 'b' and protochl was inhibited 2% and 12% at T_2 treatment, 43% and 63% at T_3 treatment, 7% and 13% at T_4 treatments. At 90 day stage, promotion was observed at all treatments and it was promoted 3%, 57% and 42% in chl. 'a'; 31%, 82% and 117% in chl. 'b' and 85%, 94% and 174% in protochlorophyll at T_2, T_3 and T_4 treatments respectively. Protochlorophyll was reached at it maximum promotion and it was observed 85%, 94% and 174% at T_2, T_3 and T_4 treatment respectively when compared with control. Thus above results indicated that growth regulators were promotory to chlorophyll development especially in 90 days stage crop growth.

At 105 days stage of crop growth inhibition was observed 20%, 26% and 23% at T_2 and 27%, 28% and 4% at T_4 treatments in chl. 'a', chl. 'b' and protochlophyll respectively. Promotion was observed 4% in chl. 'a' however inhibition was observed 34% and 53% in chl. 'b' and protochlorophyll at T_3 treatments. 120 days stage, promotion was observed 18% and 6% in chl. 'a' and chl. 'b' however inhibition was observed 14% in protochlorophyll at T_2 treatment. Inhibitory effect over control in T_3 and T_4 treatments and it was inhibited 9%, 37% and 58% at T_2 treatment and 3%, 16% and 17% at T_4 treatment in chl. 'a', chl. 'b' and protochlorophyll respectively.

These findings are conformity to the finding of Behra et al., (2000) in *Amaranthus*, Kanjlal et al., (1998) in *Chamomilla recutita (L)*; Meliha GEMICT et al., (2000) in *Lycopersicum esculentum Mill*., Ramesh, (2005) in Barley mutant; Kokare et al., (2006) in *Abelmoschus esculentum (L)*, Paul et al (2006) in *Rauvolfia serpentina*; Vamil et al., (2010) in *Bambusa. arundinaceae* similarly Garg and Ashwani, (2012) in *Euphorbia lathysis (L)* reported that IAA slightly inhibited chl.'a' but chl.'b' was not significantly influenced & IAA + IBA slightly decrease the chl. 'a' and chl.'b'; Tagade et al., (1998) in soyabean IAA (25-150 ppm) noticed that leaf chlorophyll increased with IAA concentration up to 100ppm then decrease with increasing concentration. Prakash, (1998) in *Artocarpus heterophyllus* chl. 'a' and chl. 'b' increased in IAA (100 ppm).

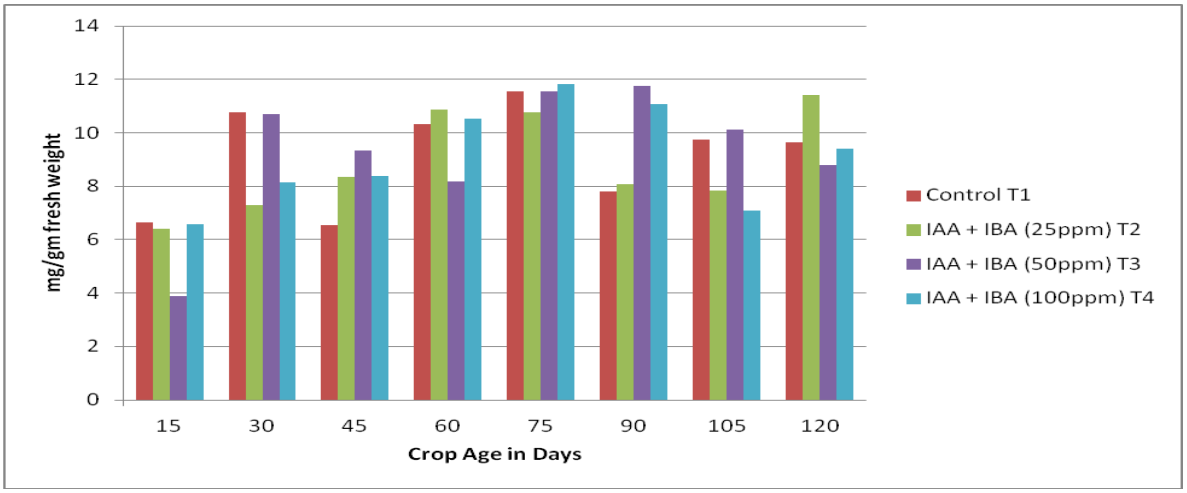

Fig. 1. Effects of plant growth regulators (Indoles) on chl. 'a' development in field of *Pisum sativum (L)(Pea).*

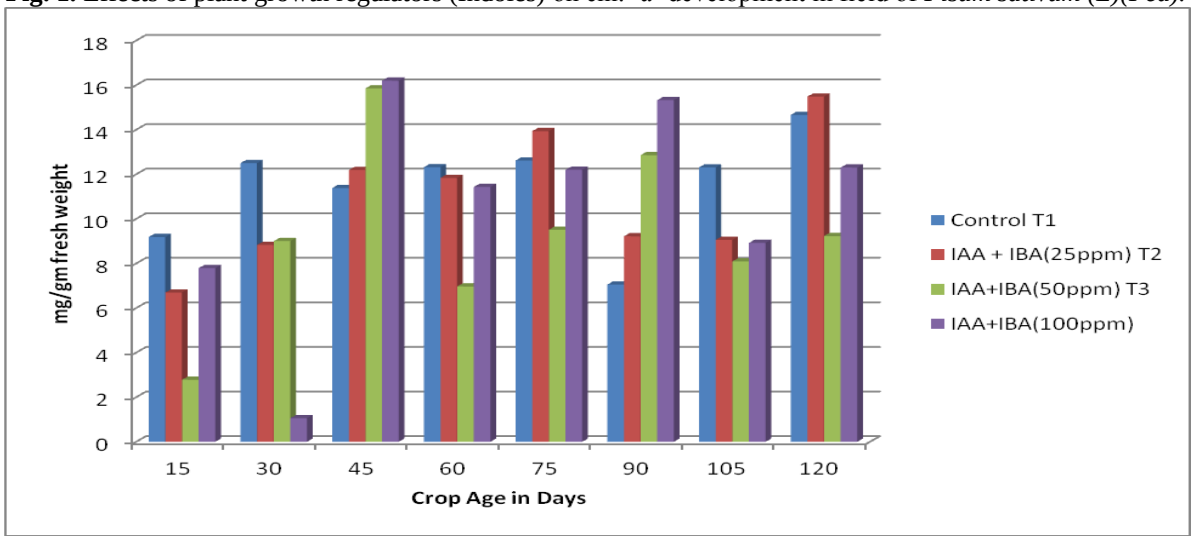

Fig. 2. Effects of plant growth regulators (Indoles) on chl. 'b' development in field of *Pisum sativum (L)(Pea).*

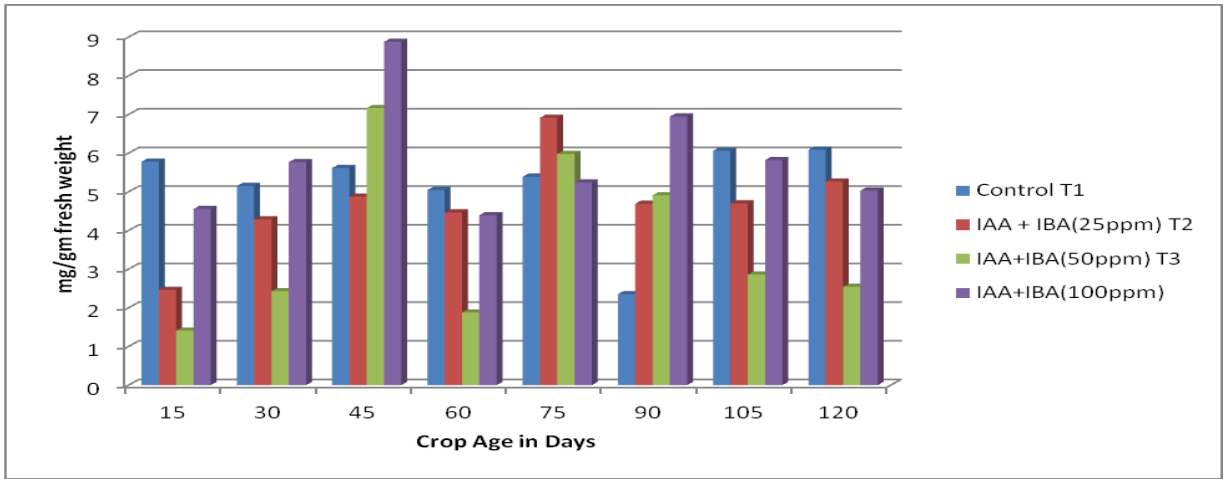

Fig. 3. Effects of plant growth regulators (Indoles) on Proto chlorophyll development in field of *Pisum sativum (L)(Pea).*

Table 1. Effect of plant growth regulators (Indoles) on chlorophyll content (mg/gm. fw) in *Pisum sativum (L)(Pea).*

		Treatment			
Crop Age In Days	**Parameter**	Control (T1)	IAA + IBA(25ppm) T2	IAA+IBA(50ppm)T3	IAA+IBA(100ppm)
15	Chl 'a'	2.192	9.072	6.613	5.425
	Chl 'b'	3.909	6.986	6.736	5.058
	Proto-Chl	3.766	5.591	3.779	2.076
30	Chl 'a'	10.768	7.285	10.690	8.152
	Chl 'b'	12.500	8.828	9.004	1.0613
	Proto-Chl	5.149	4.287	2.426	5.766
45	Chl 'a'	6.539	8.341	9.326	8.393
	Chl 'b	11.380	12.191	15.856	16.200
	Proto-Chl	5.615	4.873	7.166	8.878
60	Chl 'a'	10.334	10.875	8.162	10.524
	Chl 'b'	12.317	11.838	6.966	11.434
	Proto-Chl	5.044	4.466	1.878	4.394
75	Chl 'a'	11.562	10.772	11.544	11.811
	Chl 'b'	12.616	13.937	9.512	12.202
	Proto-Chl	5.389	6.913	5.978	5.242
90	Chl 'a'	7.805	8.076	11.763	11.067
	Chl 'b'	7.049	9.218	12.858	15.327
	Proto-Chl	2.352	4.690	4.907	6.946
05	Chl 'a'	9.750	7.822	10.112	7.101
	Chl 'b'	12.307	9.056	8.089	8.923
	Proto-Chl	6.061	4.699	2.859	5.821
120	Chl 'a'	9.635	11.413	8.796	9.394
	Chl 'b'	14.663	15.484	9.228	12.303
	Proto-Chl	6.089	5.264	2.542	5.031

REFERENCES

Behera, Bhaskar. C, and Behra prasanta, K. (1994). Chlorophyll a/b and catalase activity in four species of *Amaranthus* in relative to their tolerance to manganrse. Indian J. plant physiol., vol. xxxvii No.4 PP 259-263.

Gad El-Hak, S. H. Ahmed, A.M and Moustafa, Y.M.M (2012). Effect of foliar Application with two Antioxidants and humic acid on growth yield and yield components op peas (*Pisum Sativum L.*). Journal of Horticultural Science and ornamental plants 4(3): 318-328.

Garg, Jolly and Kumar Ashwani (2012). Effect of growth regulators on growth biomass and hydrocarbon yield of Euphorbia lathysis L: A hydrocarbon yielding plant. Prime research on biotechnology (PRB) vol.2 (2).PP.24-32.

Gemict, Meliha Guven, Avni, Yurekli, H. Kermil (2000). Effect of some growth regulators and commercial preparation on the chlorophyll content and mineral nutrition of *Lycopersicum esculentum mill*. Turk J.Bot 24(2000) 215-219.

Hassan, A.A., (1997). Vegetable fruits. Al-Dar Al-Arabia Publications and distribution, Cairo, Egypt, pp: 241.

Kanjlal, P.B and singh, R.S (1998). Effect of phytohormones on growth, yield of flower heads and essential oil chamorile(*Chamorimilla reactita (L)*. Rauschert).Indian perfumer,42(4):197-200.

Kokare, R.T. Bhalerao, R.K. Prabu, T. Chavan, S.K. Bansode, A:B and Kachare, G.S. (2006). Effect of plant growth regulators on growth, yield and quality of okra (*Abelmo schuss esculentus (L). Moench*.

Koski, V.M. and Smith, J.H.C. (1948). The Isolation and spectral observation properties of protochlorophyll from barley seedlings. J. Amer. Chem. Soc. 70: 3558-3562.

Naeem M, Iram bhatti, Raza Hafeez Ahmad, Yatin Ashraf M. (2004). Effect of some growth hormones (GA3, Iaa and kinetin) on morphology and early or delay edinitation of bud of lentil (*lens culinaris*) Medik pak. J. Bot. 3(4):801-809.

Paul, D, Paul*, N.K and Basu, P. (2006).Influence of soil moisture on some physiological characters and root and Alkaloid yield of *Rauvolfia serpentina.* J.bio-sci.14: 73-76, 2006.

Prakash, M. (1998) Effect of plant growth regulators and chemicals on germination of jack fruit. Ann plant physiol, 12 (1) :75-77.

Ramesh*, B. and Kumar Bateshwar (2005). Variation in chlorophyll content in Barley mutanta. Indian j. plant physiol., vol 10, No.1.(N.S) PP.97-99.

Sharma, M.M., Kumar, R., Jain, V.K. and Goyal, A.K. (1988). Some effects of UV irradiance on growth and development of Pea seedlings. HCPB. 5: 5-7.

Tagade, R. Deotale, R.D, Sable, S and Chore, C. N. (1998) Effect of IAA and kinetin on biochemical aspects and yield of soybean. J. Soils Crops; 8(2): 172-175.

Watt, B.K. and A.L. Merrill, (1963). Composition of foods .U.S. Department of Agriculture, Agricultural Research Service, USDA .Hand Book. 8: 190.