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The Effect of phytohormones on lower leaf and upper longer leaves in sweet potatoes (Ipomoea batatas Linn)

ADESH KUMAR AND V.K. BHATNAGAR
Dept. of Botany, Hindu College, Moradabad

Abstract

The studies were carried out at Hindu P.G. College Moradabad U.P. The Response of various concentration (10, 25, 50, 100, 200, 400 and 800 of bio regulants as cycocel GA_3 and Ethephon on the effect of phytohormones on lower leaf and upper longer in sweet potatoes. Effect of phytohormones sprays to 40 days old cauliflowers plants on photosynthetic efficiency of upper and lower leaves, recorded after three weeks of spray. It is Faily Convolvulaceae. The tubers are a source of starch suitable for sizing paper and textile and for laundry use also adhesive and dextins, composition for insulating fibre and coating formulations for dry cells and in cosmetics. Spent pulp is used as cattle feeds. Sweet potato flour is empled as a coagulated in slurry thickness in extraction of alumina from Bauxite. Employed for industrial alcohol, lactic acid, acetone butanal, vinegar and yeast. Tender tops and leave are used as vegetable or salad. So sweet potatoes are also used for curry preparation. The present investigations were carried out to explore the effects of three growth regulators VIZ. cycocel, ethephon and GA_3 on germination, vegetative growth, photosynthetic flowering no. of seed, total seed yield etc. of sweet potatoes. They are also sandy soil and they sweet potatoes are eaten raw, boiled and roosted. Chlorophyll content: GA_3 Cycocel and ethrel, when applied to 10- or 40-days old plants, slightly increased chlorophyll content. Most of the treatment when applied to 55 days plant reduced chlorophyll content of the leaves. The maximum decrease was caused by GA_3 application.

Keywords: Tubers, photosynthetic, Cycocel, Chlorophyll, potatoes, dextins, yeast

Introduction

The sweet potato is a native of in tropical America, Now it is widespread in all tropical in all tropics and some parts of the temperate zone and found abundantly in the south seas, china, Japan, Indonesia and India. It is cultivated throughout India.

The plant is a twining, trailing perennial vine with adventitious roots that end in swollen tubers (tuberous roots). The sweets potatoes required a sandy soil and a warn most climate. The plants are grown as annuals as and propagated vegetatively by using vine cuttings.

People in various parts of India seem to have traditional preference for one (white) or the other (red) colour of the skin of the tuber (tuberous roof). In the Punjab white sweet potato is hardly grown, while in Karnataka it is the white varieties which are preferred. It of the plants of India, both red and white varieties are popular. Pusa Suffaid and Pusa Sunehris are supposed to best verities in yield, quality and nutritive value.

The sweet potatoes are eaten raw, boiled and roasted. They are not only a common vegetative, but they are used for canning, dehydrating, flour manufacture and as a source of starch, glycose syrup and alcohol. Sweet potatoes are also used for curry preparation.

The tuber is a source of starch suitable for sizing paper and textile and for laundry use also used

in adheves and dextins, compositions for insulating fabrics and coating formulations for dry cells and in cosmetics. Spent pulp is used as cattle feed. Sweet potato flour is employed as a coagulant in slurry thickness in extraction of alumina from bauxine; employed for industries alcohol, lactic acid acetone acid, acetone butanol, vinegar and yeast. Tendor tops and leaves are used as vegetable or salad.

The terms vegetable is usually applied to edible plants which store up resource food in roots, stem, leaves and fruits and which are eaten, cooked or raw as salad. The vegetables rank next to cereals as sources of carbohydrates food. The nutritive value of vegetable is tremendous, because of the presence of indispensable mineral sales and vitamins. India grows a large variety of vegetable belonging to the tropical subtropical and temperate groups. However, their present availability is only 1.3 ounce per adult per day. On the other hand, a balanced diet requires ten ounces of vegetable per adult per days. A good number of the vegetable in India are introduction from foreign counties, for convenience the vegetable may be classified in three categories (I) underground vegetable (II) herbage vegetable (III) fruit vegetable ethephon has been found to affect the growth and developed of flowering plant (Bura, 1968: cooke and Randail 1968 and Anon, 1968) and causes diver Espenson in plant metabolism.

Gibberellins have been shown to enhance the synthesis of lipid in aleurone layer in Hordeum vulgare young and (1970) reported that ethephon application stimulated the carbohydrates synthesis in citrus reticulata.

Dastal and Leopold (1967) reported that ethaphon and GA_3 have opposing physiology effect in fruits ripening.

Robin et. Al. (1968) postulated that influenced of ethephon on sex expression and growth may be due to some form of anti-gibberellin activity cumber and melen normally produced male flowers earlier than female flower.

During recent years the application of phytohormones has increased tremendously for the betterment and improvement of agriculture and horticulture crops. Synthetic plant bio regulants at proper concentration and manner of their application may result increased production in out crops and other crops when a plant switches over the reproductive phase from vegetative phase, there occurs numerous complexities in physiological activities in fact, these changes are governed by plant growth regulatory substance. The phytohormones include a large number of synthetic and naturally produced compound, which bring about magnus vegetative and reproductive changes, when at proper concentrations and in an appropriates manner at suitable stage of plant growth.

The discovery of phytohormones has opened new vistas up on the horizon of crop production. They have provided man with a powerful means of stimulation the growth and development of the plants. It is the plant growth regulant, their so called, magic substance, without a particle of magic that makes plant grows that the make plant growth con mammoth size. A minute's dose in one milli part of water is sufficient to bring about fantastic change in morph otology physiology and histology of plants with this changes there is an increment in fresh and dry weight of shoot and roots. Similar finding has been reported in different crop such has sugar beet, wheat, maize, soyabean and sunflower (Pavera and Cantiliffe (1994).

Materials and Methods

Selection of Plant material: The details of the material used and experiments procedures and techniques followed for the various experiment during the course of this investigation are discretion are described below:

General: All chemical employed in the investigation were of analytical grade supplied by BDH (India unless specified otherwise.

Dehydrated absolute ethyl alcohol was supplied by Bengal chemical company, India. Etheral was supplied by Ducehem U.S.A., GA_3 acid supplied by CDH (Central Drug House) (P) Ltd. Post Box No. 7138, New Delhi-110002.

Fertilizer and other chemicals: Urea, single super phosphate, muriate of potash (Gujrat fertilizer) were obtained from crop research center, G.B. Pant University of Agriculture and Technology Pantnagar. Diathane-N-45 and sandevit were also obtained from crop research center Pantnagar.

Apparatus

1. All glassware used was either of coming India Ltd. Or Pyrez U.S.A.
2. Vaccum pump (Metrex, India)
3. Spekal (Carl Zelis Jene- DDR)
4. Luxmeter (Research- Luxmet- 300, Atlantic India).
5. Blender (Metrex, India)
6. Measuring blender.

Air Hand sprayer

Field Culture: For exposure to estimate photosynthesis efficiency of Individual leaves, a plot (19.20x12.7 sqm) was select. Anormal dose of N.P.K. was applied to the soul. About 100 seeds were sown by keeping normal distance recommended for crops. After 10 days seedling was thin to twenty.

Preparation of Hormones solution: To prepare stock solution of different hormones the following additions were made per liter. Deionized water was used for solution preparations.

Hormones	Amount added/liter(Mgs)	Concentration
GA_3	100	100
Cycocel	50	50
Ethephon (1ml=400)	1.25ml	500

GA_3 and Ethephon were directly dissolved in water. Cycocel was first dissolved in a few drops of absolute ethyl alcohol and then required volume was made by deionized water 0.22ml of "Sandovit" per liter of hormones solution was added as a surfactant.

Preparation of field: After harvesting the previous crop thoroughly ploughing was given and left as as couple of days. This was followed again by plough, planking and finally leveled. Farmyard manure was applied in good amount at the time of land preparation with the help of measuring tape, Flage and ropes the required are 19.20 meter

Foliar Spray of Hormones

Spraying stages:

1. 40 days after seedling emergence.
2. 55 days after seedling emergence.
3. 70 days after seedling emergence (flowers Stage)

Concentration of phytohormones: used seven concentrations of each hormone 10, 25, 50, 100, 200, 400, 800 ppm as given below were sprayed at every stage of development.

Treatments

Concentration (ppm)

Control	Water
GA_3	10, 25, 50, 100, 200, 400, 800 ppm
Cycocel	10, 25, 50, 100, 200, 400, 800 ppm
Ethephon	10, 25, 50, 100, 200, 400, 800 ppm

Thirty plants were sprayed for each concentration

Chemical analysis: Chemical analysis was conducted in the plant physiology Lub of Botany Department Hindu College, Moradabad and college of basic science, G.B. Pantnagar, University Pantnagar (U.A.).

Quantitative determination of chlorophyll content: Chlorophyll a, b and chlorophyll content of leaves were determined specto photometrical according to the method of Amon (1949). After the pigment were extracted in 80% acetone in a semi dark room. Weighed leaf disc. (0.01 gm fresh material) from each treatment were extracted in liters of 80% acetone and volume is to be multiplied by 0.1. Extracted repeatedly in small amount of 80 percent acetone and filtered till visibly colorless and final volume of the extract was adjusted the absorbance of pigment extract read at 645, 652 and 663 against 80 percent acetone as blank. The concentration of chlorophylls was calculated with help of Arnons (1949) equation as given below-

(1) Chlorophyll a (mg/g,$^{-1}$ fresh wt.)

$$= 12.7\ (A\ 663) - 2.69\ (A\ 645) \times \frac{V}{1000 \times W}$$

(2) Chlorophyll b (mg/gm^{-1} fresh wt)

$$= 22.9\ (A\ 645) - 4.68\ (A652) \times \frac{V}{1000 \times W}$$

(3) Total Chlorophyll (mg gm^{-1} fresh weight)

$$= 20.2\ (A645) + 8.02\ (A663) \times \frac{V}{1000 \times W}$$

(4) Chlorophyll a/b $= \frac{\text{Mg Chlophyll a/gm tissue}}{\text{Mg Chlophyll b/gm tissue}}$

In the above equation 'A' = absorbance of chlorophylls extracts at the specific indication wavelength 'V' = Final volume of solution, W gms = tissue extracted.

Climate of Moradabad: Moradabad is placed in the interior of subtropical continental region. Its climate is typineally monsoon. The meteorological data for Moradabad for year. There is seasonal rhymes of weather. Seasonal variation in temperature and moisture condition governs the distribution pattern, growth and phenology of plants in region. The terrain is also characterized by heavy rainfall and periodic-inundation of its vast area by the over flooding and shifting of river flowing through it. There are three well marked season i.e.- Summer, rainy and winter. How thorn and Hopping (1977) noted that ethephon application increased the fruits number per plant and yield in Cucurbita moschatea 19.20-meter x 12.75 meter was measured and divided into 66 sub-plots in three block or replication as per plan of lay out.

Result and Discussion

Photosynthesis

1. Chlorophyll Content: Data recorded other 3-weeks of spray top and lower (14^{th} from top leaves of plants are present).

Non-significant changes in chlorophyll content to lower and upper leaves of plants treated with different hormones was observed. However, a significance increase in chlorophyll a/b ration of bottom leaf with different treatment was found. The maximum increase in a/b ratio was seen in leaf of plants sprayed with 50 ppm ethephon (48.8% increase) and minimum increase was 26.8% with GA_3 lar ppm followed by 400 ppm (18.0%).

Table 1: Effect of Phytohormones sprays to 40 days old plants, on chlorophyll a, chlorophyll b, total chlorophyll and chlorophyll a/b ratio, in lower & upper leaves, recorded after three weeks of spray

Statements		Chlorophyll a		Chlorophyll b		Total Chlorophyll		Chlorophyll a/b	
	Conc. (ppm)	Lower leaf	Upper leaf	Lower leaf	Upper leaf	Lower leaf	Upper leaf	Lower leaf	Upper leaf
					Mg/gm fresh weight				
	D.W.	0.674	0.754	0.398	0.360	1.074	1.11	1.699	2.164
Cycocel	10	1.065	0.885	0.470	0.470	1.535	1.360	2.245	1.905
	25	1.140	0.895	0.500	0.400	1.600	1.300	2.242	2.220
	50	1.225	0.920	0.545	0.350	1.770	1.270	2.240	2.315
	100	1.240	0.930	0.560	0.330	1.780	1.250	2.235	2.400
	200	1.255	0.945	0.580	0.320	1.790	1.230	2.230	2.440
	400	1.266	0.950	0.585	0.315	1.800	1.215	2.228	2.465
	800	1.280	0.966	0.590	0.305	1.805	1.200	2.225	2.490
GA_3	10	0.822	0.599	0.340	0.260	1.170	0.860	2.380	2.342
	25	0.800	0.585	0.338	0.210	1.160	0.750	2.300	2.450
	50	0.770	0.560	0.337	0.200	1.155	0.700	2.220	2.550
	100	0.745	0.455	0.335	0.170	1.150	0.626	2.155	2.644
	200	0.730	0.450	0.330	0.150	1.140	0.600	2.140	2.690
	400	0.710	0.430	0.320	0.130	1.130	0.550	2.130	2.710
	800	0.700	0.420	0.310	0.120	1.120	0.510	2.110	2.730
Ethephon	10	0.840	0.885	0.336	0.330	1.155	1.220	2.570	2.880
	25	0.870	0.880	0.395	0.325	1.160	1.210	2.560	2.850
	50	0.880	0.878	0.400	0.320	1.175	1.205	2.525	2.800
	100	0.895	0.875	0.420	0.318	1.200	1.190	2.400	2.790
	200	0.900	0.870	0.430	0.315	1.250	1.180	2.200	2.765
	400	0.910	0.868	0.450	0.313	1.365	1.185	2.115	2.755
	800	0.915	0.865	0.455	0.310	1.385	1.170	2.105	2.740
	-	0.123	0.108	0.053	0.051	0.178	0.166	0.123	0.192
		0.425	0.365	0.103	0.124	0.570	0.534	0.407*	0.612

Significant at 5% probability level Fourteen leafs from top Eighth leaf from top

Table 2: Effect of Phytohormone sprays to 40 days old Cauliflowers on photosynthetic efficiency of upper and lower leaves, recorded after three weeks of sprays

Treatments		Cpm gm^{-1} dry wt.		Cpm Cm^{-2} leaf area	
Phytohormones	Conc. (ppm)	Lower leaf[+]	Upper Leaf[-]	Lower Leaf	Upper Leaf
Water (Control)		17100±92.4	12501±79.0	91.2±7.5	77.0±7.1
Cycocel	10	11799±77.0	11990±75.0	67.0±6.7	54.0±6.2
	25	13500±78.0	12230±80.0	78.5±6.2	65.2±7.0
	50	15330±80.0	12944±81.2	85.5±6.6	70.0±7.2
	100	16199±95.5	13099±81.0	90.0±7.5	73.0±6.9
	200	17220±93.5	14000±80.7	92.5±7.5	74.2±6.8
	400	18150±95.3	14570±81.6	91.2±7.2	75.4±6.7
	800	18770±95.4	14880±83.2	90.6±6.6	76.6±6.8
GA_3	10	14649±85.7	11890±77.1	87.0±7.4	69.0±6.8
	25	14530±86.6	11212±76.2	87.5±7.2	67.2±6.7
	50	14210±87.2	11050±75.2	88.0±7.3	64.3±6.5
	100	14149±84.0	10350±72.0	89.0±7.4	69.0±6.8
	200	14100±84.2	10212±70.0	89.5±8.0	58.6±6.2
	400	14010±83.7	10010±73.0	90.2±7.9	57.5±6.3
	800	14000±86.2	10000±71.0	92.6±7.8	56.2±6.2
Ethephon	10	18249±95.5	12224±78.3	85.0±7.2	69.0±6.7
	25	13012±96.4	12220±76.4	74.0±7.3	65.2±5.6
	50	12272±98.2	12210±77.2	70.0±7.2	63.4±6.2
	100	11077±97.2	12205±78.8	65.4±7.6	60.5±6.7
	200	10000±96.5	12750±76.3	60.6±6.2	55.6±7.2
	400	9899±70.5	12149±78.0	59.0±6.3	58.0±6.3
	800	9500±73.6	12120±77.7	58.6±6.2	58.2±6.1

[+] Fourteen leafs from top

[-] Eighth leaf from top

II. Photosynthesis efficiency: Data recorded of after 3 weeks of spray on photosynthesis efficiency of lower (14th from top) upper (8th from top) leaves of different treatment are presented.

Photosynthetic efficiency (Expressed as cpm/gm dry wt) was found to be higher in lower leaf than that of upper leaf in all the items except ethephon 500 ppm were effect was just the reverse photosynthetic efficiency of lower and upper leaves of plant given different treatment was not founded to be significantly changed in most cases. However photosynthetic efficiency of lower leaf of plants of plants sprayed with 400 ppm ethephon described to about 42.11% of that of control on their other hand photosynthetic efficiency of lower leaf of plants prayed with 50 ppm GA_3 increased by about 43.6% in comparison to that of control.

Photosynthetic efficiency (Expressed as cpm/gm^2 leaf area) was found to be higher in lower leaf than that of upper leaf in all the treatment and ethrel 400 ppm. in which no difference in photosynthetic efficiency of two leaves was found. It was noted that the photosynthetic efficiency of lever leaf in plant sprayed with ethral (400 ppm) decrease by about 35.16% of that of control while that of upper leaf of plants sprayed with GA_3 in (50 ppm) increased by about 61%. Johnson (1972) found, the infield trails, that whole or partial defoliation of sunflower plants 1-2 days before flowering reduced seed yield by 93% with total defoliation and by 26 of 30% when all leaves were removed except the 5th to 12th from the apex or the top 12 respectively.

Early stage of germination radical elongation involves the cell division and expansion and the synthesis of enzymes (Lenormand et. Al. 1993).

Photosynthetic Efficiency: The Decrease in photosynthetic efficiency by cycocel as observed have has also been reported in sunflower, oat and chichwed. It has been suggested that such inhibitory effect may be attribute to the higher concentrations of hormone used while 10^{-5}M (1.75 ppm) concentration cycocel increased photosynthetic Co_2 fixation by 2.7-fold in Avena coleoptiles, at 10-2M (1750 ppm) concentration the Co_2 fixation was markedly reduced by cycocel application. Almost similar trend of effects was obtained when photosynthetic efficiency was expressed either on leaf area basis (^{14}C counts min^{-1}, Cm^{-2}) or dry weight basis (^{14}C counts min^{-1}, mg^{-1} dry weight). Most of the treatments cycocel (50 ppm) and GA_3 (10 ppm) decreased photosynthetic $^{14}CO_2$ fixation when applied to 10 days old plants. The maximum reduction was caused by ethrel treatments. When applied to 40- or 55-days old plants most of the hormonal sprays had slight inhibit effect. However, ethereal spay (50 ppm) at 55 days caused marked increase in photosynthetic efficiency of both bottom and top leaves.

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