

## The Effect of phytohormones sprays to 55 days old black gram plants on photosynthetic efficiency of upper and lower leaves and flower opening in plants

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### Abstract

*This work was performed at the Hindu P.G. College Moradabad. Moradabad is placed in the interior of subtropical continental region. Its climate is typically monsoon. The material data for Moradabad for the years 23-24. There is a seasonal rhyme of the weather seasonal variation in temperature and moisture condition govern the distribution pattern, growth and phenology of plants in the region. Data for photosynthetic efficiency [Expressed as  $\text{cpm gm}^{-1} \text{ wt.}$ ] of upper and lower leaves of plants receiving various and ethephon (10 and 50 ppm) increased photosynthetic efficiency of lower leaf by 55.4 and 52.3% respectively. Higher concentration of GA3 (100 ppm) decrease photosynthetic efficiency by 43.3%. The seeds contain approximately 9.7% moisture, 23.4% proteins, 1.0% fat, 57.3% carbohydrates, 3.8% fibre and 4.8 % ash. It is rich in phosphoric acid to be 5-10 times more than other pulses. Dry stems and leaves after threshing are used as cattle feed. Seed are also given to animals.*

*Keywords: Carbohydrates, photosynthetic, phenology, phosphoric acid, pulses*

### Introduction

The black gram or urad bean is a bean grown in South Asia. Like its relative the mung bean, it has been reclassified from the genus *Phaseolus* to *Vigna*. The produced sold as black gram is usually the urad bean, whereas the split bean is called white lentil.

Black gram is believed to be a native of India and mainly grown in M.P., U.P., Punjab, Maharashtra, W.B. A.P. and Karnataka States. It is erect, fast growing annual herb up to 0.8m in height and grown as winter and summer crop both after as mixed crop. Leaves are large, trifoliate having ovate to lanceolate, entire 5-10 cm long leaflets subtended by short stipules. Flower is small, yellow and cluster in short hairy penduncle. Keel is spirally coiled. Pods are narrow, cylindrical with 6-10 seeds. Seeds are

oblong having flat or square ends, up to 4mm long and mostly black with smooth seeds coat. Hilum is protuberant white with concave surface. Cotyledons are white. Seeds contain approximately 9.7% moisture 23.4 proteins, 1.0% fat, 57.3% carbohydrate, 3.8 fibre and 4.8% ash. It is rich in phosphoric acid to be 5-10 times more than other pulses. Seeds are consumed whole, split pulse (dual husked or DE husked or parched). It is also used for making other dishes like idli, dosa, etc or in confectionary. Green pods are eaten as vegetable whole plant is also used as fodder for livestock it is also sometimes as a green manure.

### **Nutritional Value in Urad Dal**

It has high nutritional content, including protein, fat, Carbohydrate, Vitamins and minerals

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Nutritional Content Amount Per 100gm

Carbohydrate	58.99
Energy	341 kgal
Protein	25.21
Total Fat	1.64
Dietary Fibre	18.3
Niacin	1.447
Fats	216
Sodium	38
Potassium	983
Iron	7.57
Zinc	3.35
Phosphorus	379
Calcium	138
Magnesium	267

You can use it to prepare various food dishes, curries soup, vada etc. and also make masks and oils to pamper your hair and skin. However one must consume it's in moderation as it conlead to negative health consequences.

Regulation of flowing by growth hormones is of great economic importance in plants as it directly determines the yield (Audus, 1959; Weaver, 1972; Hedden et al., 1978).

1. Cycocel abbreviated to ccc, a quareternary ammonium compound was reported by Tolebert in 1962, Higher does of cycocel was found more effective as compared to lower deses in bajra (Yadava et al, 1980) and in sunflower (Kumari, 1981).
2. Ethephon abbreviated to cepa is being manufactured under the trade name "Ethrel was introduced as plant grown regulator by Amchem products Inc. Ambler Pennsylvania, U.S.A. releases ethylenes in plant tissue. Amcham 1967, foliar application of Ethephon induce many changes in composition of fruits of cucurbetae ous vegetables (Shanmugavela et al: 1975), tomato (Williams et al., 1999) and in Rice (Bainka and Sauter, 2005).
3. Gibberallin are of isoprenoid nature and belongs the class of compound called Diterpenes. Sever workers have revievd the physiology effects of Gibberelling in differents plants (Cleland, 1969; Yadava and Pahl, 1980; sareen, 1985, Alexander et al., 1994; Chauhan and Bashist, 200 L; Mahavir Singh, 2002, Sankaran et al, 2004; Rakesh et al; 2005.

## Methods and Materials

Moradabad is placed in the interior of subtropical continental region. Its climate is typically monsoonal. The meteorological data for Moradabad for the year 23-24. There is a seasonal rhymes of the weather seasonal variation in temperature and moisture condition governs the distribution pattern, growth and phenology of plants in the region. The terrain in also characterized by heavy rain-fall and periodic inundation of its vast area by the over flooding and shifting of rivers flowing through through its. There are three well marked season i.e. summer, rainy and winter.

### *Rainy Season*

It begins from middle of June and continues up to end of September about 80 to 900 of the total annual rainfall occurs in this season. July and August are the months when Havert precipitation take place. During these months, the means maximum tempution ranges b/w 31.5 and 33.50c and mean maximum temperature ranges 23.40c. Mean diurnal fluetion in temperature during these months ranges from 18.30c to 10.20c relative humidity during the season is very high (about 71.6 to 85.7%).

### *Selection of Plant Material*

The details of the materials used and experimental proceeding and techniques followed for the various experiments during the course of this investigation are describe below; Seeds of Urad cultivars, PU-31, COTA-4, P.U-35 were obtained from agronomy Department of G.B. Pant University of agriculture and technology, Pantnagar seeds show large variable in seed morphology among genotypes and hybrids with respect to seed colour, seed surface characteristics test and kernel texture and colour.

### *Source of Chemicals*

All chemicals employed in this investigation were of analytical grade supplied by BDH (India) unless specified otherwise. Dehydrated absolute ethyl alcohol was supplied by Begal Chemical Company, India. Enthral was supplied by Duc hem, U.S.A.

Gibberellic acid supplied by CDH (Central Drug house) (P) Ltd. post Box No. New Delhi-110002.

**Fertilizer and other Chemical**

Urea single super phosphate mature of potash (Gujrat fertilizer were obtained from crop research central G.B. Pant University of Agriculture and Technology Pantnagar. Diathane-N-45 and sandovit were also obtained from crop research centre, Pantnagar.

**Apparatus**

1. All glassware used was either of coming India L.t.d. or Pyrez, U.S.A.
2. Vacuum Pump (Metrez, India)
3. Spekhal (Carl Zelis Jena-DDR)
4. Luxmeter (Research-Luxomete-300, atlantis, India.
5. Blender (Metrax, India)
6. Measuring Slender
7. Air Hand Sprayer.

**Field Culture**

For exposure to estimate photosynthesis efficiency of individual leaves, a plot (19.20x12.75m) was select. Anormal dose of N.P.K was applied to the soul. About 100 seeds were sown by keeping normal distance recommended for Urad. After 10 days seedily were then to twenty.

**Preparation of Hormones Solutions**

To prepare stock solution of different hormones the following addition was made per litre. Deionized water was used for solution preparations.

Hormones	Amount added/ litter(mgs)	Concentration (ppm)
GA3	100	100
Cycocel 50 50		
Ethephon (1 = m= 400 mg)	1.25 ml	500

Gibberellic acid & Ethephon were directly dissolved in water. Cycocel was first a few drops of absolute ethyl alcohol and required volume was made by deionized water 0.22 ml of "Sandovit" per litre of hormone solution was added as a surfactant.

**Chemical Analysis**

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

**Foliar Spray of Hormones**

1. 55 days after seedling emergence (Bud initiation Stage)

2. 90 days after seedling emergence (Flowering Stage)

**Concentrations 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.

Treatment	Concentration (ppm)
Control	10, 25, 50, 100, 200, 400, 800 ppm
GA3	10, 25, 50, 100, 200, 400, 800 ppm
Ethephon	10, 25, 50, 100, 200, 400, 800 ppm

Thirty plants were sprayed for each concentration.

**Measurement of flowering**

Days required for required for opening of buds were recorded.

1. Seed setting and yield- At maturity, heads were harvested and were derived in oven at 750c for 5 days. After drying head dimeter, filling percentage, hundred seed wt. (for filled seeds only) and seed yield per plant (filled seeds only) were recorded.
2. Number of seed- No of seeds were carried out harvest of matured head and counts the seeds and find out the average value of no. of seeds in for each treatment.
3. Seed yield- The economic yield of each net at harvest was recorded and expressed in kg/ha. The three components of seed yield is number of heads per acre, no. of seeds per head and average seed weight.

Seed yield =

No. of head x no. of seed per hand x Average seed wt.

**Results and Discussion**

The following observation are recorded in the present investigation. Effect of phyto-hormones sprayed 55-days after seedling emergence (bud-initiation stage). Effect of phytohormone sprayed 90 days after seedling emergence (Flowering stage).

Data for photo-synthetic efficiency (expressed) as  $\text{cpm gm}^{-1} \text{ twt.}$  of upper and lower leaves of plants receiving various treatments show that lower concentration of cycocel and ethephon (10 and 50 ppm) increased photosynthetic efficiency

of lower leaf the by 55.4 and 52.3%, respectively. Higher concentration of GA3 (100 ppm) decreased photosynthetic efficiency by 43.0%. Photo-synthetic efficiency of upper leaf also increased by 95% with ethrel 50 ppm treatment. Data obtained for photo-synthetic efficiency (Expresser as cpm-cm<sup>2</sup> leaf area) of lower of upper also show that ethephen (5 and 50 ppm) increased the photosynthetic efficiency of lower leaf by treatment to the extent of 44.5% photo-synthetic efficiency of upper leaf increase by 152 and 34% with 50 and 500 ppm ethenol, while 10 ppm GA3 decreased it by 26 and 25.3% (Table 1).

**II. Flower Morphology**

Flowers formed in the plants receiving different treatments were normal (similar to control) in most cases. However, the flowers of plants treatment with GA3 (100 ppm) Showed the following

abnormal features.

- I. The flower shape changed from flat (disc-shaped) to slightly elongated
- II. Sepals and petals (ray-florets) becomes elongated (lanceolated shaped).
- III. The mature heads were completely open.
- IV. Flower are small, yellow and clustered at short hairy peduncle. Keep is spirally coiled.
- V. Pods are narrow, cylindrical with 6-10 seeds. Seeds are oblong having flat or square ends up to 4mm long and mostly black with smooth seed coat. Hilum is protuberant with concave surface. Cotyledon are white.
- VI. Seeds contain approximately 97% moisture, 23.4% protein, 1.0% fat, 57.3% Carbohydrate, 3.8% fibre and 4.8% ash. It is rich in phosphoric acid to be 5-10 times more than other pulses.

Table 1: Photo-synthetic efficiency of upper and lower leaves

Treatments		cpm gm <sup>-1</sup> dry wt.		cpm cm <sup>-2</sup> leaf area	
Phyto-hormones	Conc. (ppm)	Low leaf	Upper leaf	Low. leaf	Upper leaf
Water (Control) -		17598±98.0	13999±83.8	92.0±7.6	73.0±6.9
Cycocel	10	2750±80.0	13999±80.7	66.4±6.7	83.0±7.3
	25	12860±80.2	13112±82.6	78.6±5.8	84.2±7.8
	50	15979±89.5	13299±81.6	80.5±7.3	78.0±7.1
	100	15999±88.2	13170±92.4	82.6±7.4	78.0±8.2
	200	16000±89.7	13050±90.6	86.4±7.6	79.4±8.3
	400	16080±90.2	12000±90.7	88.3±7.8	80.6±6.7
	800	17170±90.6	12970±97.2	90.7±6.2	82.4±7.4
GA3	10	16349±90.5	12949±80.5	94.0±7.7	78.0±7.1
	25	15.270±90.4	13100±82.3	96.2±7.6	70.2±6.8
	50	13.227±87.4	13800±83.6	65.4±7.4	60.5±6.7
	100	10049±71.5	14449±85.1	51.0±6.1	54.5±6.2
	200	10000±72.5	14700±86.2	50.0±7.2	53.1±8.2
	400	09981±80.2	14925±87.1	45.2±6.2	51.2±8.1
	800	9900±86.7	15000±86.1	44.6±6.8	51.6±7.1
Ethephon	10	27349±117.0	27399±117.1	175.0±9.9	184.0±10.2
	25	25280±116.0	25412±126.2	140.0±8.9	170.2±10.3
	50	21360±127.5	20320±135.4	135.0±9.2	150.6±9.4
	100	20412±120.2	19721±130.6	130.0±8.8	130.4±9.7
	200	19623±110.4	16220±120.7	125.0±7.9	115.0±9.8
	400	18850±97.2	12599±79.5	123.0±8.5	98.0±7.8
	800	18860±98.1	12602±80.5	122.0±8.3	97.0±7.0

VII. Seeds are consumed whole, split pulse (dol, husked or parched). It is also used for making other dishes like idle, dosa, paper, bari etc. or in confectionary.

VIII. Green pods are eaten as vegetable whole plant is also used as fodder for livestock. It is also used some times as a green manner.

Table 2: Effect of foliar sprays of phyto-hormones on flower opening in black gram.

Treatments	Days required for flowering (bud opening) plant age (day) at which hormones were applied		
Phyto-hormones	Conc.	40	55
Water (Control)	-	67	70
Cycocel	10	64	70
	25	67	71
	50	68	72
	100	69	73
	200	73	74
	400	75	76
	800	78	77
GA3	10	63	64
	25	62	64
	50	60	64
	100	58	64
	200	59	65
	400	58	65
	800	57	66
Ethephon	10	60	64
	25	61	64
	50	62	64
	100	63	65
	200	62	65
	400	64	65
	800	69	66

\*Average values 6 plants (3 plate) each.

### Conclusion

The lower concentration of cycocel and Ethephon (10 and 50 ppm) increased photosynthetic efficiency of lower leaf the by 55.4 and 52.3% respectively. Higher concentration of GA3 100 ppm decreased photosynthetic efficiency by 43.0.

Photosynthetic efficiency of upper leaf also increased by 95% with ethereal 50 ppm treatments. Data obtained for photosynthetic efficiency (expressed as cpm-2 leaf area) of lower of upper also, that ethephon (5 and 50 ppm) increased the photosynthetic efficiency of lower leaf by treatment to the extent of 44.5%. Photosynthetic efficiency of upper leaf increase by 152 and 34% with 50 and 500 ppm ethereal while 10 pp, GA3 decreased it by 26 and 25.3%.

Effect of Phytohormones sprayed 55 days after seedling emergence (bud initiation stage) and 90 days after seedling emergence (flower stage).

The flower is small yellow and clustered at short hairy peduncle. Keep is spirally coil. Pods are narrow cylindrical with 6-10 seeds. Seeds are oblong having flat or square ends up to 4 mm long and mostly black with smooth seed coat. Hilum is protuberant with concave surface. Cotyledon is white.

Dry stems and leaves after threshing are used as cattle feed. Seeds are also given to animals. It is also sometimes as a green manure.

The data show that both the concentration of GA3 (10 and 100 ppm brought about an early flowering by 4 and 9 days respectively, as compared to control. Cycocel (10 ppm) and ethrel (50 ppm) also has tened flowering by 3, 4 and 4 days respectively. On the other hand cycocel (50 ppm) are ethrel (400 ppm) delayed flowering by 1 and 2 days respectively.

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