

# Comparative bio efficacy of Bioulmin-K and some other plant growth regulators on onion (*Allium cepa*) under field conditions

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**Abstract**— Plant growth regulators (PGR) or bio stimulants always play a vital role in plant health management. There are different types of PGRs, among them humic acid, amino acid, n-tricontanol were taken to study their effect on onion crop in Madhya Pradesh, India during rabi season in the year 2015. One PGR Bioulmin – K, supplied by Envosol Global Limited (ScriptFert International Group, New Zealand) with four different dosages along with three other PGRs (humic acid, amino acid and n-tricontanol) collected from local market were tried for comparative bio-efficacy testing on onion crop as foliar spray and soil application with their standard dosage. Although all the treatments showed very good effect on shoot length, bulb diameter, bulb weight and yield of onion, Bioulmin-K at 1250 ml/acre showed significantly higher effect on plant health and finally yield.

**Index Terms**— Foliar spray, soil application, PGR

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## Introduction

The onion *Allium cepa*, is an herbaceous biennial in the family Liliaceae grown for its edible bulb and is one of the most important commercial vegetable crops grown in India: The demand for onion is worldwide. It is used both in raw and mature bulb stage as vegetable and spices. The pungency in onion is due to a volatile oil known as allyl propyldisulphide. The bulb of onion consists of swollen bases of green foliage leaves and fleshy scales. Madhya Pradesh, Maharashtra, Tamil Nadu, Andhra Pradesh., Bihar and Punjab are the important onion producing states in India. In the present study an attempt has been taken to find out the effect of humic acid based plant growth regulator (PGR) or bio stimulant named Bioulmin-K against some other PGR or bio-stimulants such as humic acid, amino acid and n-tricontanol both as foliar spray and soil application under field conditions in Madhya Pradesh state during rabi season 2015.

Fertility of soil is directly related with the content of organic matter in soil. Humic matter plays a vital role within soil forming macromolecules of a mixed aliphatic and aromatic nature providing a multiple effect in soil [1]. Application of humic substances both as foliar spray and soil application enhances quality of soil and thereby improve the plant growth and uptake of nutrients. Soil application of humus increased the N uptake of wheat and foliar application of humic acid increased the uptake of P, K, Mg, N, Cu and Zn [2]. Significant improvement in fresh and dry bio mass and chlorophyll content as well as relative growth rate have been observed due to humic acid application [3]. Foliar application of humic acid substances and bio-stimulators accelerate better growth and yield of cucumber plant [4].

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### **Materials and Method**

Two field experiments in randomized block design (RBD) with three replications was conducted one at village Palsoda and other at village Chikliya, district Ratlam, Madhya Pradesh during Rabi season 2015 in the month of October (Table 1 & 2). Onion seedlings from variety East – West Perna (at village Palsoda) and JSC-Jindal Seed (at village Chikliya) were transplanted at spacing 10-15 cm between plants and 30-45 cm between rows in 100 sqmtr plot for each replication of the treatments mentioned below. Fertilizer in the form of DAP 40 kg/acre during sowing and after 15 days DAP 40 kg, Urea 40 kg, MOP 10 kg and mixed micronutrient 8 kg per acre was applied. A bio product named Bioulmin-K from Script Fert International Group, New Zealand and an amino acid in EC formulation (from trade), a humic acid in EC formulation (from trade), n-tricontanolin EW formulation (from trade) and a humic acid in granular form were taken to study the comparative bio efficacy on onion.

Foliar spray of Bioulmin-K in four different dosages along with other three PGR products viz. amino acid, humic acid and n-tricontanolin was done 45 days after transplanting. Water spray served as untreated control. First observation was taken 45 days after spraying and final observation was taken 90 days after spraying during the time of harvesting.

Soil application of Bioulmin-K mixing with dry sand in four different dosages and humic acid granules mixing with dry sand was done 45 days after transplanting. Water spray served as untreated control. First observation was taken 45 days after soil application and final observation was taken 90 days after soil application during the time of harvesting.

### **Result and Discussion**

All the treatments with Bioulmin-K showed fair effect on shoot height, bulb diameter, bulb weight and yield of onion over control in first trial where foliar spray was done (Table 3). However best result was obtained with Bioulmin-K at 1.25 ltr/acre dosage where shoot height and bulb diameter recorded 23.7 inch and 1.97 inch over control 18.3 inch and 1.50 inch respectively 45 days after spraying. Comparative treatments with three different biostimulants from three different companies also showed variable results but lower than Bioulmin-K at 1.25 ltr/acre dosage in terms of shoot height and bulb diameter 45 days after spraying. Of the three PGR products viz Amino Acid EC, Humic Acid EC and n-Tricontanolin EW, Humic Acid EC showed best effect over other two as well as over control. After 90 days of spraying during the time of harvesting, bulb diameter, bulb weight and finally yield data were recorded and again Bioulmin-K at 1.25 ltr/acre dosage showed excellent effect over control and highest yield was recorded 196.8 quintal/acre over control 177.1 quintal/acre (Fig.1 and 2). Of the other three

biostimulants Humic Acid EC at 250 ml/acre dosage showed higher yield 182.4 qnt/acre compared to Amino Acid EC and n-Tricontanol EW 173.9 and 177.1 qnt/acre respectively.

In case of second trial (Table 4) where soil application was done, Bioulmin-K again at 1.25 ltr/acre dosage showed excellent effect on shoot height and bulb diameter 45 days after application compared to Bioulmin-K used at lower dosages at 0.5, 0.75 and 1 ltr/acre dosages and over control. At 90 days after application during the time of harvesting Bioulmin-K at 1.25 ltr/acre dosage showed highest bulb diameter, bulb weight and yield like 2.5 inch, 128.7 gm and 196.8 qnt/acre respectively compared to lower dosages of Bioulmin-K applied and over control. Humic Acid GR at 2 kg/acre dosage showed almost good effect like Bioulmin-K over control but lower than Bioulmin-K at 1.25 ltr/acre dosage.

[5] reported that humic acid can accelerate cell division and shows greater root development. As a result the plants grow stronger and finally give higher yield. Humic substances can ameliorate negative soil properties thus improve the plant growth and nutrient uptake. [6] investigated the effect of foliar application of N and humic acid on the growth and yield of corn. They also reported that foliar application of humic acid caused a transitional production of plant dry mass with respect to the unfertilized control. Enhanced growth of corm of gladiolus has been reported by [7] by application of humic acid three times. Similar results were noticed by [8] in gladiolus. Several researchers reported that root proliferation is a benefit from application of humic acid at low concentration. These stimulatory effects also have been directly correlated with enhanced uptake of nitrogen, phosphorus, sulphur, zinc and iron. The present findings corroborate with the findings of [9] where there was clear evidence that increasing the level of humic acid increased cucumber growth, fruit yield and quality with soil drench or spraying humic acid application. Similar type of results were noticed by [10] on broccoli and [11] on *Plantago ovata*.

## Conclusion

Bioulmin-K at 1.25 ltr/acre dosage exhibited the best effect on onion in terms of shoot length, bulb diameter, bulb weight and yield at both 45 and 90 days after spraying over untreated control and standard check as well as Bioulmin-K used at lower dosages. Interestingly Bioulmin-K when applied as broad cast mixing with dry sand showed marginally better effect compared to foliar application. Bioulmin-K known for its special technology called bio-clasp basically helps in retention of existing nutrients in soil as well as added nutrients in soil and reduces their leaching to a great extent.

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**Table 1 :**Treatments with code adopted at village Palsoda

SI No	Treatments	Dosage/acre	Code	Replications
1	Bioulmin K	500 ml	ABSBU50	3
2	Bioulmin K	750 ml	ABSBU75	3
3	Bioulmin K	1000 ml	ABSBU100	3
4	Bioulmin K	1250 ml	ABSBU125	3
5	Amino Acid EC	250 ml	COMPARE1	3
6	Humic Acid EC	250 ml	COMPARE2	3
7	Triacantanol EW	250 ml	COMPARE3	3
8	Untreated		CONTROL	3

**Table 2 :**Treatments with code adopted at village Chikliya

SI No	Treatments	Dosage/acre	Code	Replications
1	Bioulmin K	500 ml	ABSBU50	3
2	Bioulmin K	750 ml	ABSBU75	3
3	Bioulmin K	1000 ml	ABSBU100	3
4	Bioulmin K	1250 ml	ABSBU125	3
6	Humic Acid GR	2 kg	COMPARE	3
8	Untreated		CONTROL	3

**Table 3 :** Effect of Bioulmin-K and three other PGR products on onion shoot and bulb 45 days and 90 days after spraying in village Palsoda

Village : Palsoda ( Foliar Spray )			45 days after spraying		During Harvesting ( 90 days after spraying )		
Treatments	Dosage/acre	Code	Shoot Height ( in inch )	Bulb Diameter ( in inch )	Bulb Diameter ( in inch )	Bulb Weight ( in gram )	Yield/acre ( in qnt )
Bioulmin K	500 ml	ABSBU50	21.7	1.52	2.3	92.3	177.1
Bioulmin K	750 ml	ABSBU75	22.0	1.75	2.4	89.3	177.6
Bioulmin K	1000 ml	ABSBU100	23.0	1.94	2.5	112.3	192.5
<b>Bioulmin K</b>	<b>1250 ml</b>	<b>ABSBU125</b>	<b>23.7</b>	<b>1.97</b>	<b>2.5</b>	<b>128.7</b>	<b>196.8</b>
Amino Acid EC	250 ml	COMPARE 1	20.0	1.56	2.0	94.7	173.9
Humic Acid EC	250 ml	COMPARE 2	23.7	1.85	2.3	98.0	182.4
Triacantanol EW	250 ml	COMPARE 3	15.3	1.60	2.1	93.7	176.0
Untreated		CONTROL	18.3	1.50	2.0	91.8	177.1
SEm(+/-)			0.51	0.78	0.53	0.87	0.92
CD(0.01)			1.23	1.46	1.58	1.87	1.88
CD(0.05)			2.01	2.31	2.67	2.89	2.97

\*Average of 30 samples from each replication

**Table 4 :** Effect of Bioulmin-K and one other PGR product on onion shoot and bulb 45 days and 90 days after application in village Chikliya

Village : Chikliya ( Broad Casting )			45 days after application		During Harvesting ( 90 days after application )		
Treatments	Dosage/acre	Code	Shoot Height ( in inch )	Bulb Diameter ( in inch )	Bulb Diameter ( in inch )	Bulb Weight ( in gram )	Yield/acre ( in qnt )
Bioulmin K	500 ml	ABSBU50	22.3	1.72	2.4	91.5	174.1
Bioulmin K	750 ml	ABSBU75	23.1	1.85	2.5	98.7	181.3
Bioulmin K	1000 ml	ABSBU100	23.9	1.98	2.7	118.3	195.6
<b>Bioulmin K</b>	<b>1250 ml</b>	<b>ABSBU125</b>	<b>24.8</b>	<b>1.99</b>	<b>2.9</b>	<b>137.2</b>	<b>198.9</b>
Humic Acid GR	2 kg	COMPARE	24.6	1.88	2.6	114.8	195.7
Untreated		CONTROL	20.1	1.72	1.9	88.7	173.8
SEm(+/-)			0.43	0.72	0.41	0.92	0.78
CD(0.01)			1.12	1.34	1.56	1.26	1.29
CD(0.05)			1.87	1.98	1.88	2.05	2.24

\*Average of 30 samples from each replication



**Fig. 1 :Size of bulb development at 45 days after spraying with different treatments by foliar spray**



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**Fig.2 :Size of bulb development at 90 days after spraying ( during harvesting ) with different treatments by foliar spray**

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