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To study the Phenology of Urdbean varieties for growth and development under rainfed condition

Ashwan Kumar*, Vinamarta Jain, Uma Bermaiya* and Muni Pratap Sahu***
* Department of Agronomy, College of Agriculture, Tikamgarh (M.P.)
Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.)
**Assistant Professor, S.K.S. College of Agriculture, Rajnandgaon (C.G.)
Corresponding author: ashwan0707@gmail.com

ABSTRACT
The field investigation entitled "To study the phenology of urdbean varieties for growth and development under rainfed condition" was conducted at Research Farm, J.N.K.V.V., College of Agriculture, Tikamgarh (M.P.) during Kharif 2016. The experiment was laid out in randomized block design with three replications. The field experiment was conducted with 10 different urdbean varieties viz. JU-3, IPU 94-1, LBG-20, PU-30, PU- 31, JU-86, NUL-7, PU-35, KU 96-3, Azad urd-1. Gross and net plot size viz., 4 m x 3.6 m and 3 m x 2.4 m, respectively. The soil was medium black, clayey loam in texture, alkaline in reaction and higher in total soluble salt concentration, low in nitrogen and rich in phosphorus, potassium and lime, alkaline in reaction with high base saturation. Sowing was done by manually. The seed was placed at 4-5 cm depth manually in furrows 30 cm apart drawn by manual labour with help of kudal From the result of experiment it can be concluded that, among different varieties in urdbean, plant height, total dry biomass, leaf area index, number of primary and secondry branches, number of root nodules and crop growth rate were recorded significantly higher under PU-31 and found the lowest in cv. NUL-7.
***Key Words**: Urdbean, Phenology, Different varieties, Growth and Development.*

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INTRODUCTION

Urdbean (*Vigna mungo* L.) originated in India, where it has been in cultivation from ancient times and is one of the most highly priced pulses of India. The crop is resistant to adverse climatic conditions and it improves the soil fertility by fixing atmospheric nitrogen in the soil. In India, urdbean grown in 3.06 million ha area with total production of 1.70 million tones and average productivity is 555 kg ha^{-1} (Anonymous 2014). In Madhya Pradesh, it occupies an area of 0.60 million ha. with the production and productivity of 0.23 million tones and 376 kg ha^{-1}, respectively. In Tikamgarh district, urdbean is grown in 84.50 thousand hectare area with annual production of 60.07 thousand tones and average productivity of 711 kg ha^{-1}. (Annual action plan, Krishi Vigyan Kendra, Tikamgarh, 2015 – 16).

The most important pulses growing states are Madhya Pradesh, Uttar Pradesh, Maharashtra, Andhra Pradesh, Karnataka and Bihar which together account for 80% of total production. The decreasing per capita availability of pulses from 69 g in 1961 to 37 g in 2011 in the country has been a serious problem. Alleviate protein energy malnutrition, a minimum of 50g pulses/capita/day should be available in addition to other sources of protein such as cereals, milk, meat and eggs. India grows nearly 24 million hectare pulse

crops and produce nearly 15.9 million tone of pulse grain, which is still deficit of the present consumption, i.e. 17.65 million tones [1]. They also stated that at least 29.30 million tone of pulses are required by 2020.

Urdbean is perfect combination of all nutrients, which includes proteins (25-26%), carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins. It stands next to soybean in its dietary protein content. It is rich in vitamin A, B1, B3 and has small amount of thiamine, riboflavin, niacin and vitamin C. It contains 78% to 80% nitrogen in the form of albumin and globulin. The dry seeds are good source of phosphorus. It also has very high calorie content. 100 g of urdbean has 347 calories.

MATERIALS AND METHODS

A field experiment was undertaken at research Farm, J.N.K.V.V., College of Agriculture, Tikamgarh (M.P.) during *Kharif* 2016 to study the "To study the phenology of urdbean varieties for growth and development under rainfed condition". The soil of experimental plot was clayey loam in texture, medium in organic carbon (0.62 %), poor in nitrogen (233 kg ha^{-1}), poor in available phosphorus (16.7 kg ha^{-1}), high in potash (497 kg ha^{-1}) and (pH 7.2). The experiment was laid out in randomized block design with three replications. The field experiment was conducted with 10 different urdbean varieties *viz.* JU-3, IPU 94-1, LBG-20, PU-30, PU-31, JU 86, NUL-7, PU-35, KU 96-3 and Azad urd-1. The urdbean varieties were sown on 14th July, 2016. The recommended seed rate 25 kg ha^{-1} was used to maintain the optimum plant population of urdbean varieties. Before sowing, seeds were first treated with a fungicide "Thirum" @ 3 g kg^{-1} seed and then inoculated with *Rhizobium* culture @ 10 g kg^{-1} seed, just before sowing. The seed was placed at 4-5 cm depth manually in furrows 30 cm apart drawn by manual labour with help of *kudali* after fertilizer application and rows were covered with soil immediately after seeding. The growth observations were recorded at 15, 30, 45, 60 DAS and at harvest where as the growth and development were recorded at harvest.

RESULTS AND DISCUSSION

Effect of varieties on growth and development :

The performance of variety PU-31 as regard to growth and development *viz.*, plant height, total dry biomass, leaf area index, number of primary and secondry branches, number of root nodules and crop growth rate was significantly superior as compared to PU-30 and NUL-7.

The varieties selected for the present investigation were PU-31, PU-30 and NUL-7. Urdbean varieties *viz.*, PU-31 and NUL-7 recorded more or less similar height in early stage which might be due to slow during seeding stage. During later stage comparatively taller plant height was observed in respect of variety PU-31. These findings are in line with earlier findings by Verma and Garg [8], Bhowaland and Bhowmik [1] and Panotra *et al.* (2016). The mean total dry matter per plant was influenced due to Urdbean varieties. Variety PU-31 Produce significantly more dry matter as compared to PU-30 and NUL-7 at all growth stages. This might be due to higher biomass potential of the variety such differential dry matter production in different urdbean variety PU-31 produced significantly more dry matter as compared to PU-30 and NUL-7 at all growth stages. This might be due to higher biomass potential of the variety such differential dry matter production in different urdbean were reported by Chaudhary *et al.* [2], Singh and Rana [7], Mahalakshmi *et al.* [3] and Patil and Salimath [6]. More highest leaf area index per plant were noticed in variety PU-31 as compared to PU-30 and NUL-7 during all crop growth stages. The probable reason for this may be the genetical potential of the genotype that has helped in producing highest leaf area index. These findings are in line with earlier findings by Mahalakshmi *et al.* [3], Panotra *et. al* [5] and Patil and Salimath [6].

The urdbean variety PU-31 recorded maximum number of primary branches per plant which was significantly superior over varieties PU-30 and NUL-7. PU-31 genotype might be due to the maximum number of primary branches that has been reflected through improvement in different number of primary branches. Similar findings were reported by Mahalakshmi *et al.* [3], Bhowaland and Bhowmik [1] and Verma and Garg [8]. Urdbean varieties differed significantly in number of root nodules per plant. The genotype PU-31 recorded maximum number of root nodules per plant as compared to PU-30 and NUL-7

which might be due to its maximum number of root nodules efficiency similar trend was observed by Navgire *et al.* [4].

Genotype PU-31 produced significantly more number of dry weight of nodules (mg plant^{-1}) as compared to PU-30 and NUL-7 indicating its dry weight of root nodules. Urdbean genotype PU-31 highest crop growth rate (CGR) which was found significantly superior over NUL-7 and found at par with variety JU-3. The higher crop growth rate (CGR) of PU-31 as compared to JU-3 might be due to accumulation of crop growth rate (CGR). These findings are in conformity with the findings of Patil and Salimath [6].

. Table 1: Effect of different urdbean varieties on plant height and leaf area index

Treatment number	Varieties	Plant height (cm)					Leaf area index			
		15 DAS	30 DAS	45 DAS	60 DAS	At harvest	15 DAS	30 DAS	45 DAS	60 DAS
T1	JU-3	8.82	22.61	54.47	60.23	61.40	0.27	0.72	1.34	1.76
T2	IPU-94-1	8.37	20.06	48.43	56.43	56.67	0.25	0.64	1.24	1.60
T3	LBG-20	7.71	17.70	38.30	54.20	54.53	0.21	0.52	1.03	1.35
T4	PU-30	9.00	24.00	54.70	65.53	65.82	0.28	0.75	1.38	1.85
T5	PU-31	9.25	24.09	61.01	67.73	67.84	0.34	0.91	2.16	1.98
T6	JU-86	8.75	22.33	51.63	59.47	60.60	0.26	0.71	1.22	1.70
T7	NUL-7	7.47	17.58	40.00	48.00	49.40	0.20	0.45	0.70	1.24
T8	PU-35	8.39	20.32	49.13	57.67	58.00	0.25	0.67	1.21	1.61
T9	KU-96-3	8.11	19.87	46.57	55.12	55.27	0.24	0.63	1.31	1.58
T10	Azad urd-1	8.05	17.96	40.00	54.37	54.74	0.22	0.60	1.07	1.39
SEm+		**0.42**	**0.33**	**0.37**	**0.40**	**0.62**	**0.03**	**0.08**	**0.33**	**0.31**
CD (P= 0.05)		**1.28**	**1.02**	**1.13**	**1.24**	**1.92**	**0.10**	**0.23**	**1.01**	**0.95**

Table 2: Effect of different urdbean varieties on crop growth rate

		Crop growth rate (g plant^{-1} day^{-1})			
Treatment No.	**Varieties**	**0-15**	**15-30**	**30-45**	**45-60**
		DAS	**DAS**	**DAS**	**DAS**
T1	JU-3	0.017	0.141	0.196	0.473
T_2	IPU-94-1	0.016	0.123	0.190	0.346
T_3	LBG-20	0.014	0.111	0.169	0.317
T_4	PU-30	0.018	0.151	0.217	0.456
T_5	PU-31	0.019	0.151	0.219	0.648
T_6	JU-86	0.017	0.127	0.209	0.446
T_7	NUL-7	0.014	0.110	0.134	0.277
T_8	PU-35	0.017	0.124	0.201	0.389
T_9	KU-96-3	0.015	0.119	0.191	0.345
T10	Azad urd-1	0.014	0.116	0.194	0.309
SEm+		**0.003**	**0.091**	**0.142**	**0.308**
CD (P= 0.05)		**0.008**	**0.281**	**0.435**	**0.946**

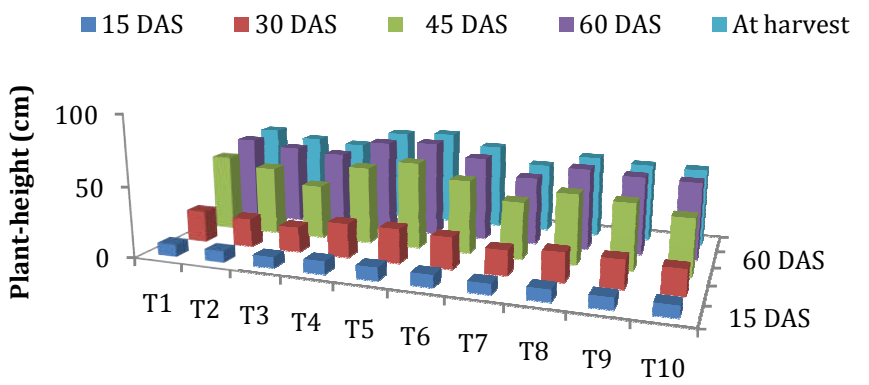

Fig .1 . Plant height (cm) of different urdbean variety at various growth rate

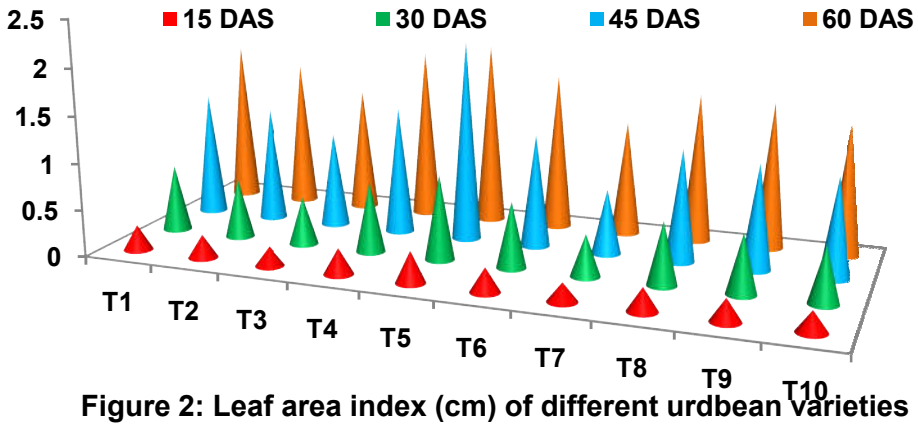

Figure 2: Leaf area index (cm) of different urdbean varieties at various growth intervals

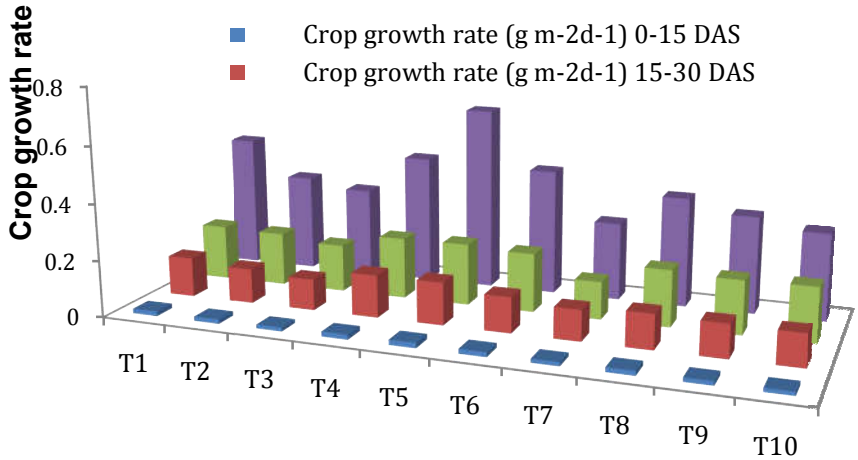

Figure 3: Crop growth rate(g plant^{-1} day^{-1}) at various growth intervals

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