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Short Communication

Influence of plant growth regulators and micronutrients on seed quality of urdbean (*Vigna mungo* L.) CV. LBG-625 (Rashmi)

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ABSTRACT

The present study was conducted at UAS, Bangalore during 2015-16 on urdbean LBG-625 (Rashmi) with nine treatments to assess the influence of plant growth regulators and micronutrients on seed quality.The results revealed that application of recommended dose of NPK (25:50:25 kg/ha) + GA_3 @ 30 ppm recorded significantly higher test weight (59.03 g), germination (88.10 %), seedling vigour index I & II (2531 and 514), TDH (0.440 OD at A_{480} nm), protein (24.96 %) and field emergence (85 %), compared to control.

Key words: GA_3, IAA, Micronutrients, NAA, Seedling vigour index, TDH

Urdbean (*Vigna mungo* L.), also known as blackgram, urid, urd, urdbean, and is a seed that's cultivated in Southern Asia. Urdbean is widely grown grain legume and belongs to the family Fabaceae and assumes considerable importance from the point of food and nutritional security in the world. Urdbean is favourable short duration pulse crop as it thrives better in all seasons either as sole, intercrop or fallow crop. In India during 2016-17 urdbean was cultivated in an area of 4.49 m ha with a production of 2.92 mt with productivity of 651 kg/ha (Directorate of Economics and Statistics, 2016-17). Important states producing urdbean are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka and Bihar. In Karnataka, urdbean occupies 71 t ha with a production of 20 ttonns and productivity is 282 kg ha^{-1}. The country productivity is higher than state productivity (Anon 2015).

The productivity of urdbean is not sufficient enough to meet the domestic demand of the Indian population. Hence, there is a need for enhancement of the productivity of urdbean by proper agronomic practices. Several strategies have been initiated to boost the productivity of urdbean. The promising one among them is foliar application of organic and inorganic sources of nutrients for exploiting genetic potential of the crop. This is considered to be an efficient and economic method of supplementing part of the nutrients requirements during critical stages. Diversion of food from sink to source and arresting of vegetative growth in urdbean is an essential criterion to obtain higher seed yield and quality. (Chandrasekhar and Bangarusamy, 2003).

Growth regulating substances/growth regulators are known to influence a wide array of physiological parameters *viz*., alteration of plant architecture, assimilate partitioning, promotion of photosynthesis, uptake of nutrients (mineral ions), enhancing nitrogen metabolism, promotion of flowering, uniform pod formation, increased mobilization of assimilates to defined sinks, induction of synchrony in flowering and delayed senescence of leaves and improved seed quality (Sharma *et al.* 2013). The micronutrients play very important role in determining the yield potential in pulses. Foliar application is credited with the advantage of quick and efficient utilization of nutrients, elimination of losses through leaching and fixation and least regulation in uptake of nutrient by plants (Manonmani and Srimathi, 2009). Thus, foliar application of nutrients using water soluble fertilizer is one of the possible ways to enhance seed yield and quality of urdbean.

The field experiment was conducted during *rabi* season of 2015-16 at I block, ZARS, VC Farm, Mandya, University of agricultural sciences, Bengaluru. The soil of the experiment site was sandy loam with pH 5.30, organic carbon 0.51(%) and available N, P_2O_5, K_2O_5 was 226, 33, 156 kg/ha respectively. The treatments comprised of T_1: RDF (Recommended dose of fertilizer) + foliar application of Boron (0.5%), T_2: RDF + foliar application of IAA @ 600 ppm, T_3: RDF + foliar application of Ethrel @ 250 ppm, T_4: RDF + foliar application of GA_3 @ 30 ppm, T_5: RDF + foliar application of Thiourea @ 500 ppm, T_6: RDF + foliar application of Salicylic acid @ 100 ppm, T_7: RDF+foliar application of NAA @ 40 ppm, T_8: RDF + foliar application of $FeSO_4$ (0.5%), T_9: RDF. The experiment was laid out in a Randomized Complete Block Design with three replications and sown with a spacing of 30 X 10 cm as per recommended package of practices (Anon. 2014). The resultant seeds obtained from each treatments of field experiment were cleaned, graded and their seed quality parameters were assessed as prescribed by ISTA (Anon. 2014) and the experiment was conducted in laboratory of the Department of Seed Science and Technology, UAS, GKVK, Bangalore.

Growth regulators and micronutrients are essential for the plant growth and development. Different parameters were studied in this experiment which is discussed below:

Test weight: Test weight (g) of urdbean was highly significant over the control (Table 1). The crop provided with RDF + foliar application of GA_3 @ 30 ppm recorded (59.03g) compared to RDF (52.76 g).

Germination: Significant differences were noticed in germination per cent among the treatments. The highest germination per cent recorded in RDF + foliar application of GA_3 @ 30 ppm, recorded (88.10%) as compared to RDF (80.14%) fig. 2.

application of GA_3 @ 30 ppm, as compared to RDF (1749 and 413, respectively). Higher vigour index might be due to the efficient protein synthesis and better source to sink relationship which resulted in better development of seeds (Kumar *et al*. 2004) Fig. 2.

Total dehydrogenase activity: Dehydrogenase enzyme is essential for protein synthesis and energy production during germination. So, total dehydrogenase activity is one of the effective parameter to assess the quality of seeds. Highest TDH activity was recorded in RDF + foliar application of GA_3 @ 30 ppm (0.440 A_{480} nm) and lowest

Table 1. Effect of plant growth regulators and micronutrients on seed quality of urdbean

Treatments	Test weight (g)	Germination (%)	SVI I	SVI II	TDH (OD at A 480 nm)	Protein (%)	Field emergence (%)
T1	54.90	84.00	2,053	452	0.353	23.76	80.67
T2	56.81	86.30	2,177	485	0.378	24.22	83.67
T3	54.37	84.25	2,018	447	0.355	23.29	82.67
T4	59.03	88.10	2,531	514	0.440	24.96	85
T5	55.40	85.15	2,125	459	0.379	23.36	80.67
T6	54.18	82.80	1,959	445	0.362	23.55	79.67
T7	56.29	86.41	2,265	489	0.374	24.37	83.67
T8	54.60	83.50	1,953	449	0.353	23.62	80
T9	52.76	80.14	1,749	413	0.346	22	76.67
S.Em±	1.09	1.34	48	9	0.01	0.476	1.46
CD (P=0.05)	3.56	5.31	188	233	0.36	0.672	6.31
CV (%)	3.95	3.16	5	4	5.26	3.5	3.1

The possible reason may be due to the applications of gibberellic acid, the amino acid content in embryo increases and responsible for the release of hydrolytic enzyme required for digestion of endospermic starch when seeds renew growth at germination. Gibberellic acid was observed more effective and responsive to the regulation of radicle and plumule elongation (Chakrabarti and Mukherji, 2003).

Seedling vigour index I and II: The significantly higher seedling vigour Index-I and seedling vigour Index II (2,531 and 514, respectively) were recorded in RDF + foliar

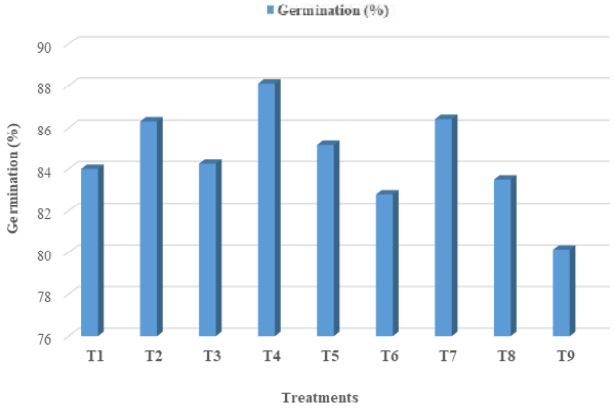

Fig 1. Influence of plant growth regulators and micronutrients on germination (%) in gram cv. LBG 625 (Rashmi)

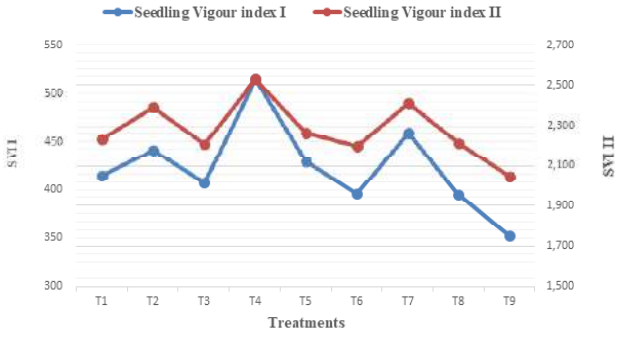

Fig 2. Influence of plant growth regulators and micronutrients on seedling vigour index I seedling vigour index II in blackgram cv. LBG 625 (Rashmi)

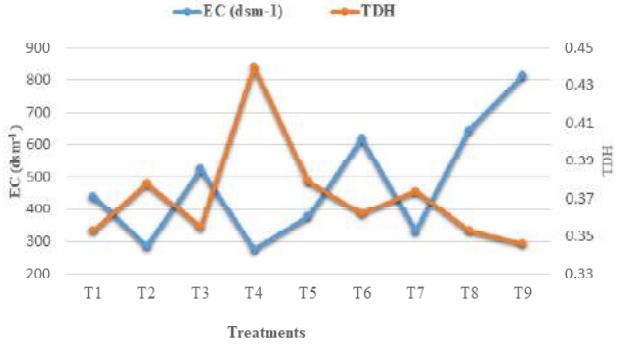

Fig 3. Influence of plant growth regulators and micronutrients on EC (dsm^{-1}) and TDH (OD A_{480} nm) in urdbean cv. LBG-625 (Rashmi)

was recorded in RDF (Control) (0.346 OD at A_{480} nm) Fig. 3.

Protein percentage: Significant differences were noticed in protein per cent among the treatments. The highest protein per cent recorded in RDF + foliar application of GA_3 @ 30 ppm, recorded (24.96%) as compared to RDF (22%). The appropriate reason might be due to GA_3 increases amino acid content in seeds (Dheeba *et al.* 2015). These amino acids are prerequisite for protein synthesis.

Field emergence: Maximum field emergence of the resultant seeds was noticed in RDF + foliar application of GA_3 @ 30 ppm, (85%), and was lower (76.67%) in RDF (Control). This might be due to GA_3 release hydrolytic enzyme required for digestion of endospermic starch when seeds renew growth at germination (Chakrabarti and Mukherji, 2003). Plant growth regulators and micronutrients are essential components of growth and development of plant system. Experiment provides sufficient scientific evidences that the application of recommended dose of fertilizers (RDF) and foliar application of GA_3 @ 30 ppm, improve the seed quality of blackgram.

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