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Original Article**How to cultivate productive and profitable Urd bean (Black gram) in Summer Season**Muyeen I Nargund¹, Rupali Singh², Abhinandan Singh^{2*}, S. Pazhanisamy³ and Sudip Sarkar⁴¹*School of Agriculture, ITM University, Gwalior, (M.P)- 474001*²*Department of Agronomy, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, U.P. - 224229, India*³*Borlaug Institute for South Asia, CIMMYT, Pusa, Bihar, 848125*⁴*ICAR Research Complex for Eastern Region, Patna - 800014***Corresponding Author: agabhi92@gmail.com**Received: 14/10/2024**Published: 17/10/2024***INTRODUCTION**

Urdbean (*Vigna mungo* L.) is one of the important pulse crops grown in India and contributes about 10% of total pulse production. It belongs to the family Fabaceae and is commonly known as urd bean, minapa pappu, black mapte, mash kalai, and uddu, etc. The world's largest producer and consumer of black gram is India. In India, black gram is grown in a 3.75 million ha area with a total production of 2.49 million tonnes and productivity of 664 kg/ha out of which 1.82 million ha area with a production of 1.35 million tonnes and productivity of 739 kg/ha is under Madhya Pradesh with first rank Anonymous (2018). Every 100 grams of seed contains the energy of 341 Kcal, Protein of 25.21 gm, Fat of 1.64 gm, dietary fiber of 18.3 gm, and carbohydrates of 58.99 gm. It also contains 154 mg calcium, 9.1 mg iron, and 38 mg beta-carotene Gowda and Kaul (1982). It contributes a major portion of lysine in a vegetarian diet and fairly a good quantity of vitamins and much-needed iron and phosphorus Solh (2009). Pulse crops are usually called poor man's meat Reddy (2010). It is the main ingredient in many south Indian dishes like vada, papad, dosa, and idly and is often consumed as germinated seeds (sprouts) or Dal. Black gram is cultivated as a single crop in cropping systems with persistent moisture, it is also grown as a catch crop, sequential crop, and mixed crop. They are also grown as intercrop, fodder crop for silage, and green manure crops. But during the rabi and zaid (summer) seasons, it is grown as a single crop. It has the capacity to fix atmospheric nitrogen through symbiotic nitrogen fixation up to 22.10 kg per hectare through root nodules with the help of Rhizobium bacteria. It can withstand drought conditions and prevents soil erosion because it is a deep-rooted crop. Moreover, it is used as nutritious fodder, particularly for dairy animals.

Importance of urd bean

Black gram is utilized as a green manure crop and nutritional fodder crop for milch cattle. Generally, it is consumed in the form of 'Dal'. It is a vital pulse crop cultivated all over India. It helps in reducing soil erosion and competes with weeds effectively due to its deep root system and foliage cover. Black gram is rich in phosphoric acid and contains protein (25%), carbohydrates (60%), and fat (1.3%) Black gram contains fibres that help in the muscle growth and movement of your stools, which can help with digestion. Hence, it can be applied to treat both constipation and diarrhea. It enables your organs to receive more oxygenated blood, which increases your energy. As you mature, it improves your bone mineral density, making your bones stronger and healthier.

Diabetes patients benefit greatly from black gram since it controls blood glucose levels. It is healthy for your skin and can help in the treatment of blemishes, acne, and dark spots. It helps to ease joint discomfort, has fantastic cardiac benefits, and acts as a diuretic that can help to keep your body clean. Including black gram in your diet can significantly improve your general health.

Preparation of soil

Black grams can be grown on a wide range of soils, from light cotton soils to sandy soils. A well-drained loam with a pH of 6.5 to 7.8 is the best type of soil. Alkaline and saline soils are ineffective for growing black gram. Like any other kharif season pulse crop, the land is prepped. But, in the summer, complete preparation is needed to provide a soil that is completely free from weeds and stubbles. After the harvest of the rabi crops, the field is prepared for the summer black gram by crisscross moghda once, followed by two harrowing. The land should be level. Clean the land before sowing by removing weeds, stones, and the leftovers of previous crop. At the last harvest, combine five to six tonnes of FYM or compost. One pre-sowing irrigation should be provided, if necessary.

Sowing methods

a) Sowing

Black gram Sowing should be done in line sowing or drilling method with tractor drawn fertilizer-cum-seed drill. Fertilizer-cum-seed drill should be used for the application of fertilizers and seed sowing at a time. Ideally, seeds should only be placed 5 to 6 cm deep. Black grams should be sown during the second fortnight of June (15-30 June), during the kharif season. during the summer season, Sowing should be done on the third week of February to the first week of April. Avoid late sowing.



b) Seed Treatment

For the seed treatment of urd bean, 250 g of PSB or 200 g of rhizobium per 10 kg of seed and Thiram @2.5 g/kg seed should be used to treat the seed. One week before Rhizobium treatment against Root knot and Reniform nematode, Blackgram under intensive cropping should get a carbofuran treatment at a rate of 0.2%.



b) Seed Rate

seed rate is 15-20 kg/ha for Kharif Season with a spacing of Row-to-Row 30 cm and plant-to-plant 10cm. and 25-30 kg/ha for summer or rabi with a spacing of Row-to-Row 20-25 cm and plant-to-plant 10cm.

Table 1: Suitable varieties with production for Summer Season

Sr. no.	State	Varieties	Duration (Days)	Production (kg/ha)	Characters
1.	Rajasthan, U.P.	KPU 524-65	68-75	10-12	Moderately resistant to MYMV, leaf spot and anthracnose
2.	Tamil Nadu	VBN 11	70-75	12-15	Moderately resistant reaction to MYMV, leaf spot and anthracnose
3.	KA, TN, AP, Odisha	CO 6	80-90	8-9	Moderately resistant to YMV
4.	South states	VBN 10	70-75	11-13	Resistant to Leaf Crinkle Virus and Leaf Curl Virus diseases. Suitable for rabi season in South zone states
5.	Tamil Nadu	Vamban 2	65	10-12	Resistant to Yellow Mosaic Virus.
6.	West Bengal	Azad Urd -1	75-80	10-12	Suitable for low altitude, spring season resistant to yellow mosaic virus (YMV)
7.	South states	VBN 8	65 - 70	9-10	High yield and resistant to yellow mosaic virus disease and moderately resistant to powdery mildew. Suitable for summer in South zone states

Table 2: Recommended Dose of fertilizers and their time of application

Sr. No.	Recommended Dose (kg/ha)	Fertilizer (kg/ha)	Time of application
1.	20 kg N	44 kg Urea	Basal application at the of sowing with fertilizer-seed drill
2.	40 kg P	250 kg SSP	Basal application at the of sowing with fertilizer-seed drill
3.	40 kg K	67 kg MOP	Basal application at the of sowing with fertilizer-seed drill

4.	20 kg S	9.24 kg Elemental sulphur	Basal application
5.	25 kg Zn	70.42 kg Zinc Sulphate	Basal application
6.	2% DAP	4.34 kg DAP	Pre- flowering
7.	2% KCL	4 kg KCL	Pre- flowering

Manures and fertilizer

Apply about 5 to 6 tons of farmyard manure or compost. Pulse yield is considerably increased by 20:40:40 NPK kg/ha combined with 20 kg S/ha, which also benefits the following crop. Among the micronutrients, Zn is the most inadequate nutrient. As a result, using Zn at a base rate of 25 kg/ha produces excellent results. A foliar spray of 2% DAP and 2% KCL at Pre flowering stage enhances the yield.

Irrigation management

Black gram does not require irrigation in rainy seasons. Throughout in summer, irrigation should be given in accordance with irrigation water availability and critical stages. Irrigate as soon as the seeds are sown. The frequency and number of irrigations depend on the soil type and the weather. Irrigation of the crop should continue every 10 to 15 days. The field must have enough moisture for the entire flowering and pod-development stages. If there is moisture stress, spray KCL at 0.5 percent (1 kg/ha) on the leaves during the vegetative stage. (Sankaralingam, 2019) The sprinkler method of irrigation required eight numbers of irrigation with the quantity of 431.2 mm and achieved water savings of 14.5% compared to the conventional method of irrigation and recorded higher water use efficiency of 2.08kg/cm³. Given the cost of cultivation, net return, and BCR, the treatment combination of machine sowing on a flatbed with a seed rate of 25 kg/ha under spray irrigation has produced a better yield (1298 kg/ha) and BCR (4.96).



Weed management

pre-emergence application of pendimethalin 1.0 kg/ha on 3 DAS fb acifluorfen-sodium (16.5%) + clodinafop-propargyl (8% EC) 187.5 g/ha on 20 DAS effectively reduced weed density and dry matter production (Jagadesh and Raju, 2021). Or post-emergence application of sodium acifluorfen 16.5% + clodinafop-propargyl 8% EC 206.25 + 100 g/ha at 22 DAS results in efficient control of both the grassy and broad-leaved weeds in black gram with significant improvement in the growth, yield and economics of black gram (Mudalagiriappa *et al.* 2022).

Table 3: Comparison with Summer and Kharif Urd bean

Year	Summer Black gram				Kharif Black gram			
Year	Plant height	No of branches	Number Pods per plant	Seed index	Plant height	No of branches	Number Pods per plant	Seed index
2020	42.80	6.95	36.2	4.50	42.46	6.75	34.27	3.81
2021	43.00	7.80	36.5	4.90	40.90	7.10	35.40	4.20
2022	41.80	7.23	41.3	4.30	41.20	6.53	40.40	4.10

Pest and disease management

a) Yellow mosaic virus:

1. Grow tolerant or resistant varieties like VBN(Bg) 7, Pratap urd 1 etc
2. Diseased plants should be rogued out to prevent the further spread of the disease.
3. In order to prevent whitefly (*Bemisia* spp.) infestation spray with triazophos 40 EC at 2.0 ml/lit. or malathion 50 EC at 2.0 ml/lit.

b) Powdery Mildew

1. Adopt clean cultivation by destroying diseased plant refuge.
2. Delayed sowing with wider spacings considerably reduces the disease severity
3. Spray with water soluble sulphur 80 WP @ 4 kg/liter or Carbendazin 50 WP @ 1 g/lit.

c) Leaf Blight

1. The diseased plants should be uprooted and destroyed so that the sclerotia do not form or survive
2. Spray with Carbendazim 50 WP @ 1 g/liter of water at an interval of 15 days with the appearance of the symptoms.

Anthracnose

1. Remove and destruct plant debris
2. Seed treatment with Carbendazim 2g/kg or Spray Mancozeb 2g/lit or Carbendazim 0.5g/lit.

d) Aphids

1. Spray with Dimethoate 30 EC (1.7 ml/ lit.) or Imidacloprid 17.8 SL @ 0.2 ml/liter of water.
2. Spray with 5% crude neem extract or 2% neem oil 3000 ppm

e) Spotted Pod Borer

1. Plants that are infected can be physically shaken over containers of oil and water or greasy cloth will help the population reduction.
2. Spray Bacillus thuringiensis 5 WG @ 1.0 g/liter of water. The most efficient way to control this pest is to spray it with spinosad 45 SC at 0.2 ml/liters per liter of water.

f) Pod Bug

1. During flowering and at the stage of pod formation, spray Monocrotophos 36 SL with 1.0 ml/liter water.

g) Tobacco Caterpillar

1. Collection and destruction of egg masses and newly hatched larvae along with skeletonised leaves can reduce infestation.
2. Spray Malathion 50 EC @ 2.0 ml/lit. or foliar application of Novaluron 10 EC @ 0.75 ml/lit

Seed production of Urd bean

For the production of Black gram seeds, such fields should be selected, in which moong was not grown in the previous season. For Black gram, there should not be another field of Black gram within a distance of 10 meters around the crop to prevent contamination from adjacent fields. Good preparation of soil, use of proper manure and fertilizers, control of weeds, pests, and diseases

Harvesting, Threshing and Storage

When most of the pods have become black and 70–80% of them have reached maturity, black gram should be harvested. The result of over maturity could be shattering. Crops should be dried on the threshing floor for a few days before being threshed. Threshing can be carried out manually or by bullocks being tramped under. To properly store the clean seeds in the suitable bins, they should be sun dried for 3 to 4 days to reduce their moisture content to 8 to 10%.

Yield and Economics**Table 4:** Cost of cultivation and net income of Urdbean

Year	Summer Black gram				Kharif Black gram			
Year	Yield (q/ha)	Cost of cultivation (Rs. ha ⁻¹)	Gross return (Rs. ha ⁻¹)	Net return (Rs. ha ⁻¹)	Yield (q/ha)	Cost of cultivation (Rs. ha ⁻¹)	Gross return (Rs. ha ⁻¹)	Net return (Rs. ha ⁻¹)
2020	10.24	25,497	73283	46786	8.25	24699	52053	30354
2021	10.19	26660	72380	44720	9.70	26,860	64230	37370
2022	10.70	20400	50960	30560	10.53	28,520	82,971	53,721

CONCLUSION

Though India led the world in both area and production of pulse crops, its productivity is below that of the rest of the world, and it varies with time. It is cultivated in different states of India, Such as Madhya Pradesh, Andhra Pradesh, Uttar Pradesh, Bihar, Haryana etc. As shown in the table 4, In an average summer Urd bean Cultivation was provided 9.03% higher yield as Compare to the Kharif Urdbean. because of the higher rate of photosynthesis. good quality is being achieved along with higher production in summer season.

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