Evaluation of Promising Mungbean Genotypes at Central Terai of Nepal

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Abstract: In order to select the superior genotypes for Nepal's central terai, sixteen mungbean varieties from the Grain Legume Research Program, Khajura, Banke, were tested at the Directorate of Agriculture Research, Parwanipur, Bara. In the years 2021 and 2022, an experiment with alpha lattice design and two replications were conducted on these genotypes. Plant height, number of pods per plant, seed per pod, 100 seed weight, flowering and maturity days from sowing, and yield ton per hectare (t/ha) were the parameters compared. Early maturation was observed in VC 1973A, VC 3890A, and VC 6148 during the two years of observation. In 2021, KPS # 1 produced the highest mean grain yield (0.50 t/ha), followed by CN 95 (0.42 t/ha), VC 3890A (0.41 t/ha), and Pant Mung 2 (0.40 t/ha). In contrast, in 2022, these genotypes' yields were 1.82 t/ha in KPS # 1, 1.79 t/ha in VC 3890A, 1.75 t/ha in Pant Mung 2, and 1.67 t/ha in CN 95. Due to the water-logged conditions brought on by heavy rainfall during the flowering to maturity period in 2021, the yield of test genotypes was low. The better genotypes may provide future varieties or serve as valuable genetic resources for breeding programs aimed at develop new varieties appropriate for Nepal's central terai.

Keywords: Mungbean, Promising genotypes, Yield, Central Terai, Parwanipur

Introduction

Mungbean (*Vigna radiata* (L.) R. Wilczek var *radiata*), also known as green gram or moong, is an important food and cash crop grown in tropical and subtropical regions (Kim et al., 2015). Rich in readily absorbed protein, minerals, and vitamins, mungbean seeds can help to enhance and vary diets heavy in cereal (Hou et al., 2019).

The short growing season and mungbean's ability to fix atmospheric nitrogen (58-109 kg/ha) to improve total soil fertility have made it a popular choice for double and intercropping systems, especially between cereals (Ilyas et al., 2018). The production of mungbean has significantly increased in past 20 years and consumer demand due to the crop's growing agronomic, nutritional, and economic benefits on a worldwide scale (Kim et al., 2015). Due to its short growing season, mungbean is becoming more and more well-known for its ability to diversify and intensify cropping systems based on cereals, diversify diets, and provide ecosystem services (Hazra et al., 2020). Mungbean is source of digestible protein (25-28%) that provides a nutritious addition to a cereal-based diet (Parihar et al., 2017a).

Southeast Asia is the primary producer of mungbean, with India and Myanmar producing the most at 1.6 million tons (Mt) and 1.597 Mt, respectively (Nair et al., 2020). Significant efforts have been undertaken in the last ten years to create superior cultivars. Up until now, the majority of crop development efforts have concentrated on developing biotic tolerance and raising yield potential (Nair et al., 2020). In comparison to other grain legumes, mungbean's production potential is now comparatively low in the Indian subcontinent (Kim et al., 2015). According to Nair et al. (2020), the genetic base of modern mungbean cultivars is limited.

Hence to improve mungbean production and productivity, it is important to develop the high yielding cultivars. Therefore coordinated varietal trial was conducted at Directorate of Agricultural Research (DoAR), Madhesh Province, Parwanipur, Bara to select high yielding mungbean cultivars for central terai of Nepal.

Material and Methods

Sixteen promising cultivars of mungbean received from Grain Legume Research Program, Khajura, Banke were evaluated at Directorate of Agricultural Research, Madhesh Province, Parwanipur, Bara during 2021 and 2022 to select high yielding cultivar. The trial was laid out in alpha lattice design with 16 entries and two replications. Spacing was maintained as row to row spacing of 40 cm and plant to plant continuous within an individual plot size of 6 m^2. The fertilizer dose applied was 20:40:20 ($N:P_2O_5:K_2O$) kg per hectare. Data recording was done for traits such as plant height, days to flowering, days to maturity, pods per plant, seed per plot, 100 seed weight and grain yield (t/ha) and analyzed using software Genstat discovery.

Results and Discussion

Meterological Information

The weather data at DoAR, Parwanipur, Bara, during the year 2021 and 2022 were recorded as shown in Figure 1 and 2. The cumulative rainfall during the experimental period of 2021 was 1112.99 mm (Figure 1) while it was recorded 858.83 mm during 2021 (Figure 2).

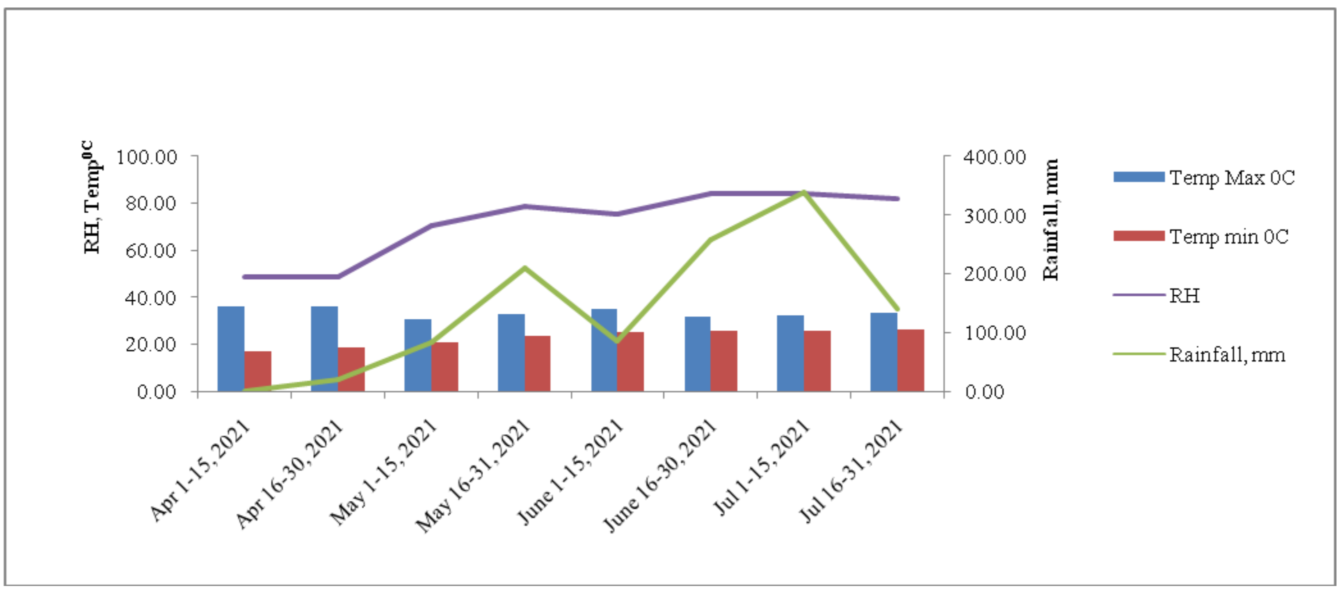

Figure 1: Weather data during 2021

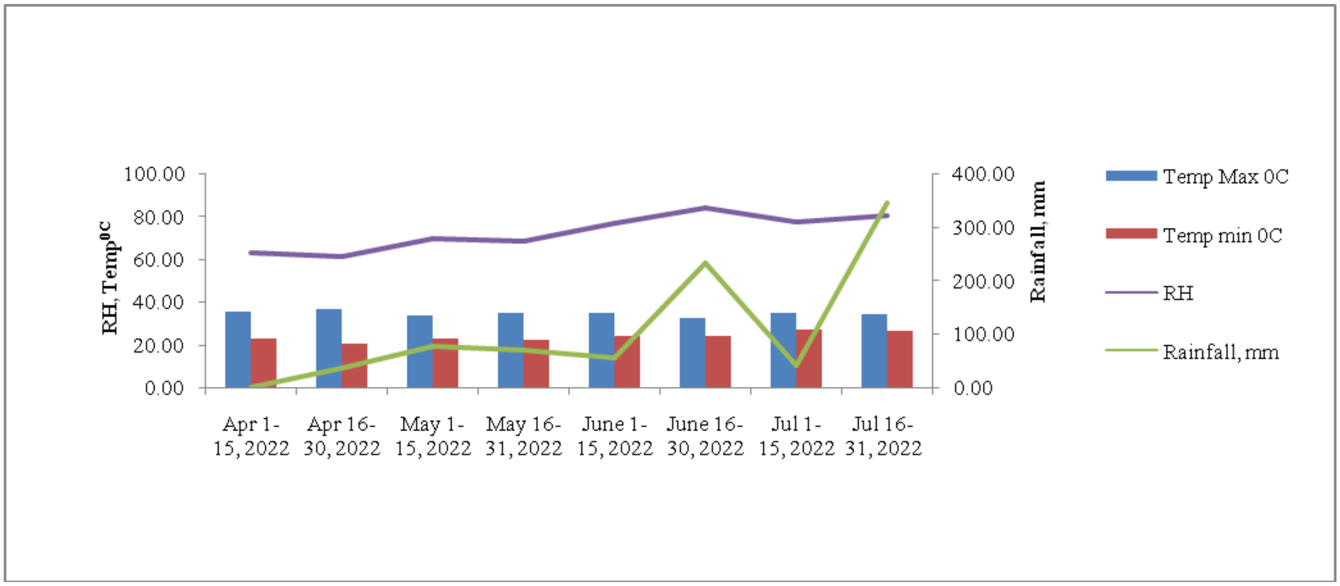

Figure 2: Weather data during 2022

Performances of Mungbean Genotypes

During 2021, result revealed that days to maturity, pods per plant and grain yield were found highly significant while days to flowering, plant height, seed per pod and 100 seed weight were found non-significant to each other. The grain yield was lower in the year 2021 due to the continuous rainfall during crop period from flowering to maturity stage of the crop compared to the year 2022. However, among the tested genotypes, the highest mean grain yield was produced by KPS # 1 (0.50 t/ha) followed by CN 95 (0.42 t/ha),VC 3890A (0.41 t/ha) and Pant Mung 2 (0.40 t/ha), respectively (Table 1).

Table 1**:** Yield and yield attributes of mungbean genotypes in CVT at DoAR, Parwanipur, Bara, 2021

Entry no.	Entries	DF (Days)	DM (Days)	PH (cm)	Pods/plant	Seed/ Pod	100-seed wt. (g)	GY (t/ha)
1	VC 6148 (50-12)	31.00	77.00	53.10	8.00	7.00	2.91	0.08
2	VC 6173C	32.00	79.00	65.00	13.00	10.00	3.78	0.04
3	VC 6173A	32.00	78.00	70.00	18.00	11.00	3.70	0.21
4	NM 54	32.00	77.00	75.60	18.00	10.00	3.29	0.05
5	VC 1973A(sc)	32.00	76.00	73.80	18.00	10.00	3.65	0.07
6	NM 92	28.00	77.00	68.60	19.00	11.00	3.70	0.14
7	VC 6386(46-40-4)	31.00	78.00	72.10	16.00	10.00	3.68	0.16
8	KPS #1	29.00	78.00	61.90	12.00	10.00	3.90	0.50
9	CN 95	31.00	77.00	72.10	13.00	12.00	3.88	0.42
10	VC 3890A	28.00	76.00	66.40	10.00	9.00	4.07	0.41
11	VC 3960A-88	29.00	77.00	68.20	23.00	11.00	4.08	0.36
12	SMARAT	30.00	79.00	74.50	17.00	10.00	2.96	0.26
13	Pant Mung 2	30.00	79.00	73.30	15.00	10.00	3.58	0.40
14	VC 6370A	30.00	78.00	65.70	15.00	10.00	4.56	0.38
15	VC 6369 (23-11)	31.00	79.00	71.30	13.00	11.00	3.79	0.37
16	Partigya	29.00	78.00	63.80	16.00	10.00	3.62	0.38
Mean		30.31	77.69	68.46	15.25	10.13	3.70	0.26
F-test		Ns	**	Ns	**	Ns	Ns	**

CV (%)	4.3	0.37	10.68	18.45	11.57	11.13	88.01
LSD (<0.05)	-	0.59	-	5	-	-	0.32

Note: DF-Days to flowering; DM-Days to Maturity; PH-Plant height (cm), GY-Grain yield (t/ha)

Table 2: Yield and yield attributes of mungbean genotypes in CVT at DoAR, Parwanipur, Bara, 2022

Entry no.	Entries	DF (Days)	DM (Days)	PH (cm)	Pods/plant	Seed/ pod	100-seed wt. (g)	GY (t/ha)
1	VC 6148 (50-12)	36.50	57.00	54.00	8.60	9.75	1.15	1.15
2	VC 6173C	38.00	57.50	53.70	13.60	9.95	1.22	1.22
3	VC 6173A	36.00	55.50	53.20	16.10	9.30	1.62	1.62
4	NM 54	36.00	56.50	53.10	12.70	10.20	1.59	1.59
5	VC 1973A(sc)	37.00	56.50	57.30	14.00	9.45	1.65	1.65
6	NM 92	37.00	56.50	54.20	15.70	9.65	1.58	1.58
7	VC 6386(46-40-4)	36.00	55.50	57.20	13.20	10.40	1.53	1.53
8	KPS #1	37.50	57.50	56.40	17.30	9.80	1.82	1.82
9	CN 95	36.50	56.50	52.90	13.80	10.15	1.67	1.67
10	VC 3890A	36.00	56.50	54.50	12.00	9.00	1.79	1.79
11	VC 3960A-88	36.50	56.50	54.80	18.60	9.40	1.41	1.41
12	SMARAT	36.00	56.50	53.60	15.50	10.90	1.60	1.60
13	Pant Mung 2	37.00	57.00	51.60	15.00	9.05	1.75	1.75
14	VC 6370A	35.50	55.50	50.10	15.30	9.55	1.48	1.48
15	VC 6369 (23-11)	38.00	57.50	50.60	18.80	9.85	1.49	1.49
16	Partigya	36.00	56.00	51.70	18.70	10.70	1.47	1.47
	Mean	36.59	56.53	53.68	14.93	9.82	4.47	1.55
	F-test	*	**	Ns	Ns	Ns	**	Ns
	CV (%)	1.70	0.90	8.40	27.00	5.20	4.50	11.90
	LSD (<0.05)	1.35	1.03	-	-	-	0.43	-

Note: DF-Days to flowering; DM-Days to Maturity; PH-Plant height (cm), GY-Grain yield (kg/ha)

During 2022, the parameters such as days to flowering, days to maturity, and 100 seed weight were found highly significant while, plant height, pods per plant, seed per pod and grain yield were found non-significant to each other. However, in tested genotypes, the highest mean grain yield was produced by KPS # 1 (1.82 t/ha) followed by VC 3890A (1.79 t/ha), Pant Mung 2 (1.75 t/ha) and CN 95 (1.67 t/ha). Data on growth and yield attributing characteristics are shown in Table 2.

The mean yield of the genotypes recorded was only 0.26 t/ha during 2021 due to high rainfall during the crop period where as in 2022 the mean yield of the tested genotypes were found to be 1.55 t/ha. Raza et al. (2019) and Lamichaney et al. (2021) corroborate this result, pointing out that agro-climatic conditions depend on the crop's stage, the degree of stress, and the environmental factors that are present. These factors affect crop phenological events like flowering time, total crop duration, and grain filling (reproductive) period. Water logging has a negative effect on mungbean, especially in Southeast Asia where there is considerable monsoon rainfall during the reproductive stage, which lowers grain quality and yield (Kyu et al., 2021).

Conclusions

The genotypes such as KPS # 1, VC 3890A, Pant Mung 2 and CN 95 were found to be comparatively high yielding during both the years, hence could be option for genetic source for varietal development which are suitable for central terai of Nepal. Farmer's field experiment is required in future to validate our results.

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Authors Contributions

The research was designed B.P. Yadav; the trial and data recording were carried out by M. K. Sah, B. Yonjan, P. Budhathoki, and A. Chaudhary; the manuscript was written by A. Chaudhary and M. K. Sah; A. Mishra and P. Poudel, R. D. Chaudhary and P. Sah revised the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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