

Short Communication

Genotypic compatibility and planting pattern in urdbean and maize intercropping system

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Intercropping of urdbean (*Vigna mungo* L. Hepper) with maize (*Zea mays*) is a common practice particularly in northern India. Normally, seeds of local varieties of both these component crops are used and grown in mixture in different proportions. This results in poor and uneven plant stand, varied degrees of competition, and difficulty in crop management which consequently lead to low yield. Several high yielding varieties of urdbean have been developed in the recent past, but their performance under intercropping system with maize has not yet been studied. In intercropping system, genotypic compatibility and planting arrangement are major considerations for achieving higher productivity and land use efficiency (1). Keeping these facts in view, the present study was undertaken to find out compatible genotype(s) of urdbean for its intercropping with maize in suitable planting arrangement.

The field experiment was conducted during *kharif* season of 2003 and 2004 at G.B.Pant University of Agriculture and Technology, Pantnagar. The soil was sandy loam with pH 6.9, medium in available phosphorus (11.0 kg ha⁻¹) and rich in available potassium (293.5 kg ha⁻¹) and organic carbon (0.76%). Four varieties of urdbean, viz., Pant U 19, Narendra Urd 1 (NU 1), UPU 97-10 and UPU 99-2 were grown in sole and intercropped with maize (Gaurav) in 1:1 (1 row of urdbean between two rows of normal row planted maize at 60 cm), 2:1 (1 row of urdbean between two pairs of paired row planted maize at 30/90 cm) and 2:2 (2 rows of urdbean between two pairs of paired row maize at 30/90 cm). Two sole croppings of maize were also included, one as normal row planting at 60 cm apart and other as paired row planting at 30/90 cm. The row spacing of sole urdbean genotypes was 30 cm. The plant to plant spacing of urdbean was 10 cm and of maize was 20 cm. Nitrogen dose of maize under intercropping treatments was reduced to 75% of recommended dose (120 kg N ha⁻¹). Full dose of phosphorus (46 kg P₂O₅ ha⁻¹) and 1/3rd N was applied as basal at the time of sowing, 1/3rd at knee high and remaining 1/3rd was top dressed at tasseling stage in maize. Urea and DAP (18-46-0) were used as source for N and P, respectively.

Sole urdbean was given 50 kg DAP ha⁻¹ at sowing time; fertilizer in intercropping treatments of urdbean was given as per row arrangement. Treated seeds of urdbean @ 15 kg⁻¹ ha and maize @ 25 kg⁻¹ ha were sown as per the treatments. The crop was sown on 9th July in 2003 and 21 July in 2004. The experiment was laid out in a randomized block design with four replications. The dry matter of above ground biomass was collected from 0.75 m row length from each plot at 20-days interval.

Dry matter accumulation in the component crops was influenced by intercropping and planting patterns. The growth curves of urdbean (Fig.1) revealed that during the initial 30

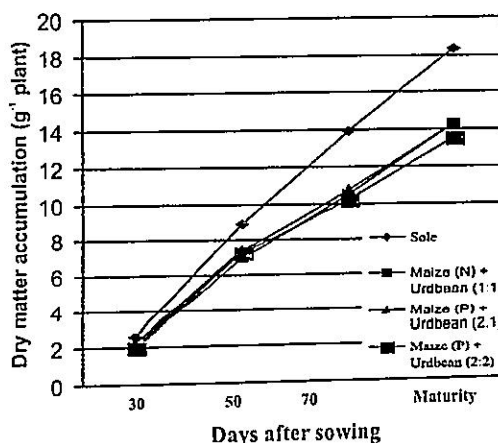


Fig. 1: Pattern of dry matter accumulation of urdbean genotypes (mean of two years)

days after sowing, the dry matter accumulation was slow but thereafter it increased rapidly, both in sole and intercropping treatments. All the genotypes showed maximum dry matter production at maturity in sole as well as intercropping systems (Table 1). Dry matter accumulation in urdbean under sole and intercropping systems was almost similar till 30 days after sowing, but thereafter it declined in system compared with the sole crop. This could be attributed to the competition for light and space offered by maize in the system. Among different genotypes of urdbean, Pant U 19 accumulated more dry matter than others both in sole and intercropping systems

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Table 1. Dry matter accumulation (g plant⁻¹) of urdbean and maize under different systems of cropping (pooled data of two years)

Treatment	30 DAS		50 DAS		70 DAS		Maturity	
	Urdbean	Maize	Urdbean	Maize	Urdbean	Maize	Urdbean	Maize
Sole urdbean (Pant U 19)	2.6	—	8.8	—	14.6	—	20.4	—
Sole urdbean (NU 1)	2.4	—	9.2	—	14.6	—	18.1	—
Sole urdbean (UPU 97-10)	3.0	—	9.3	—	14.6	—	18.5	—
Sole urdbean (UPU 99-2)	2.2	—	8.1	—	11.6	—	16.6	—
Maize (Normal) + PU 19 (1:1)	2.1	8.8	7.7	40.6	11.4	77.9	16.2	125.0
Maize (Normal) + NU 1 (1:1)	1.7	9.1	6.8	40.7	9.7	77.5	13.9	122.5
Maize (Normal) + UPU 97-10 (1:1)	2.0	9.4	6.9	40.3	11.6	76.9	13.9	115.1
Maize (Normal) + UPU 99-2 (1:1)	1.9	9.8	6.6	44.1	9.2	81.1	13.1	125.0
Maize (Paired) + PU 19 (2:1)	2.2	9.5	7.6	41.6	12.0	73.1	14.9	116.7
Maize (Paired) + NU 1 (2:1)	2.1	10.9	8.2	41.1	10.4	76.4	13.8	120.0
Maize (Paired) + UPU 97-10 (2:1)	2.3	9.0	7.5	41.4	10.7	81.0	14.9	120.0
Maize (Paired) + UPU 99-2 (2:1)	2.0	11.0	6.4	40.7	9.8	72.1	13.7	117.6
Maize (Paired) + PU 19 (2:2)	2.1	10.4	7.7	40.0	11.2	75.4	14.7	121.2
Maize (Paired) + NU 1 (2:2)	2.1	10.1	7.6	42.2	10.5	71.1	12.7	120.6
Maize (Paired) + UPU 97-10 (2:2)	2.1	10.3	6.4	43.0	9.8	73.6	12.9	127.6
Maize (Paired) + UPU 99-2 (2:2)	1.7	10.3	7.4	42.3	9.4	71.3	13.6	118.4
Maize Normal (Sole)	—	9.9	—	43.8	—	79.0	—	117.8
Maize Paired (Sole)	—	10.5	—	40.0	—	81.1	—	120.9
SEm±	0.2	0.9	0.6	1.9	0.7	3.5	0.7	2.8
CD(P=.05)	0.6	—	—	—	2.0	—	2.0	—

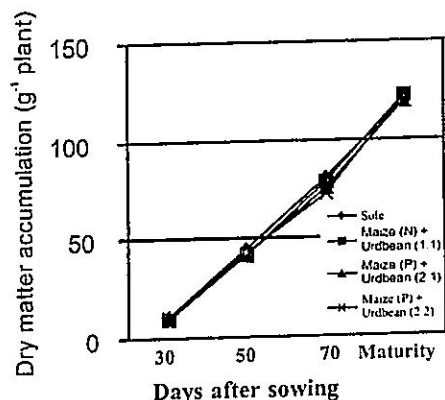


Fig. 2: Pattern of dry matter accumulation of maize (mean of two years)

in different ratios, highest being at 1:1 ratio with normal row planting of maize (Table 1). The linear growth curve revealed less suppression of maize crop growth by urdbean genotypes intercropped in different row ratios (Fig.2). Among urdbean genotypes, Pant U 19 being at par with UPU 97-10 produced significantly higher yield than the other two genotypes in sole cropping (Table 2). NU 1 gave significantly higher yield than UPU 99-2. Intercropping significantly decreased the yield of all the urdbean genotypes. Urdbean genotype UPU 99-2 was found to be low yielder both under sole and intercropping systems. Considering the yield under sole cropping, urdbean genotype UPU 97-10 recorded the highest yield loss under intercropping systems as compared to other genotypes.

Table 2. Grain yield, land equivalent ratio (LER) and harvest index of urdbean under intercropping with maize (pooled data of two years)

Treatment	Grain yield (kg ha ⁻¹)		LER	Harvest index (%) of urdbean
	Urd-bean	Maize		
Sole urdbean (Pant U 19)	1261	—	1.00	23.0
Sole urdbean (NU 1)	1045	—	1.00	22.0
Sole urdbean (UPU 97-10)	1263	—	1.00	23.0
Sole urdbean (UPU 99-2)	818	—	1.00	21.0
Maize (Normal) + PU 19 (1:1)	477	4533	1.37	25.0
Maize (Normal) + NU 1 (1:1)	417	4408	1.37	23.0
Maize (Normal) + UPU 97-10 (1:1)	409	4542	1.33	26.0
Maize (Normal) + UPU 99-2 (1:1)	283	4495	1.34	23.0
Maize (Paired) + PU 19 (2:1)	340	4261	1.20	26.0
Maize (Paired) + NU 1 (2:1)	297	4409	1.25	24.0
Maize (Paired) + UPU 97-10 (2:1)	275	4391	1.18	22.0
Maize (Paired) + UPU 99-2 (2:1)	248	4500	1.29	21.0
Maize (Paired) + PU 19 (2:2)	413	4280	1.26	24.0
Maize (Paired) + NU 1 (2:2)	378	4320	1.29	22.0
Maize (Paired) + UPU 97-10 (2:2)	342	4525	1.26	22.0
Maize (Paired) + UPU 99-2 (2:2)	276	4357	1.29	22.0
Maize Normal (Sole)	—	4550	1.00	—
Maize Paired (Sole)	—	4603	1.00	—
SEm±	40	92	0.04	0.13
CD(P=.05)	121	280	0.11	—

Quayyum and Maniruzzaman (3) observed lower yield of urdbean under intercropping with maize. Pant U 19 produced

the highest yield which was at par with NU 1 and UPU 97-10 in 1:1 ratio and only NU 1 in 2:2 ratio and was significantly higher than all other treatments. Kumar *et al.* (2) also reported differential response of urdbean varieties in intercropping system with maize. The grain yield of maize was not significantly influenced by different intercropping treatments (Table 2).

Intercropping treatments improved the land use efficiency irrespective of variety and planting arrangement (Table 2). Intercropping of all the urdbean genotypes in 1:1 ratio with normal row planted maize registered significantly higher land equivalent ratio than 2:1 ratios except UPU 99-2 and 2:2 ratio except NU 1 and UPU 99-2 with paired row maize. Pant U 19 and NU 1 recorded the highest land equivalent ratio (1.37) in 1:1 ratio, whereas UPU 97-10 in 2:1 ratio recorded the lowest value of LER (1.18). Thus, intercropping of urdbean with paired row planted maize in 2:1 ratio proved to be less efficient than the two other ratios as reflected in the lower LER values.

All the urdbean genotypes had the identical harvest

index under sole cropping (Table 2), indicating that intercropping treatments could not influence partitioning of photosynthates significantly. However, urdbean genotype UPU-97-10 in 1:1 ratio and Pant U 19 in 2:1 ratio recorded the highest value of harvest index, whereas UPU 99-2 recorded the lowest harvest index both in sole and intercropping treatments.

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