

**Supplementary Table 1.** Weather parameters during crop growth stages

Environments	Soil type	Season	Months	Temperature (°C)			Rainfall (mm)	Crop growth stages
				Max	Min	Mean		
Tamil Nadu Rice Research Institute, Aduthurai (E1)	Alluvial clay (pH: 7.5)	Rabi 2014	Jan-14	29.71	22.32	26.02	7.68	Sowing and vegetative stage
			Feb-14	31.87	23.22	27.55	6.72	Flowering and reproductive stage
			Mar-14	34.24	24.83	29.54	6.17	Maturity and harvesting
			Mean	31.94	23.46	27.70		
			Total				20.57	
Soil and Water Management Research Institute, Kattuthottam (E2)	Sandy loam (pH: 6.9)	Rabi 2014	Jan-14	30.66	21.16	25.91	11.96	Sowing and vegetative stage
			Feb-14	33.36	22.01	27.69	24.93	Flowering and reproductive stage
			Mar-14	36.03	23.49	29.76	25.75	Maturity and harvesting
			Mean	33.35	22.22	27.79		
			Total				62.64	
National Pulses Research Centre (E3)	Red lateritic (pH: 6.5)	Rabi 2014	Jan-14	28.58	23.35	25.97	0.83	Sowing and vegetative stage
			Feb-14	30.29	23.81	27.05	20.26	Flowering and reproductive stage
			Mar-14	32.63	25.29	28.96	2.48	Maturity and harvesting
			Mean	30.50	24.15	27.33		
			Total				23.57	

Note: Min, Minimum; Max, Maximum

**Supplementary Table 2.** Estimates of mean values, range, broad sense heritability ( $h^2_b$  %) for eight yield-related traits in the  $M_2$  generation of blackgram cultivars viz., ADT3, CO6 and TU 17-9 (continued)

Varieties		cv. ADT3					cv. Co 6					cv. TU 17-9				
Traits	Treatments Parameters	Control (CV1)	200 Gy (A1)	300 Gy (A2)	400 Gy (A3)	500 Gy (A4)	Control (CV2)	200 Gy (C1)	300 Gy (C2)	400 Gy (C3)	500 Gy (C4)	Control (CV3)	200 Gy (T1)	300 Gy (T2)	400 Gy (T3)	500 Gy (T4)
PH	Mean	31.00	26.08	26.03	26.22	24.95	27.66	26.71	26.33	27.32	24.94	30.42	26.85	24.97	27.51	25.05
	Min		3.00	17.50	16.60	16.00		2.68	15.40	17.80	17.20		12.00	14.20	14.00	12.70
	Max		44.20	39.20	44.00	65.00		37.40	39.20	45.20	33.80		55.20	37.10	61.20	40.20
	Her		50.92	28.66	32.53	65.40		67.12	66.28	69.79	38.09		68.71	46.87	75.65	54.22
	% deviation		-15.87	-16.03	-15.42	-19.52		-3.43	-4.81	-1.23	-9.83		-11.74	-17.92	-9.57	-17.65
NB	Mean	4.00	2.99	2.43	2.19	2.05	3.70	2.58	2.60	2.31	2.22	3.00	2.20	1.94	2.22	1.96
	Min		1.00	1.00	1.00	1.00		1.00	1.00	1.00	0.00		1.00	1.00	0.00	1.00
	Max		6.00	4.00	5.00	5.00		5.00	8.00	6.00	5.00		5.00	4.00	6.00	4.00
	Her		65.67	7.83	43.32	11.60		60.56	72.83	60.92	50.53		53.85	32.89	65.77	33.14
	% deviation		-25.25	-39.25	-45.25	-48.75		-30.27	-29.73	-37.57	-40.00		-26.67	-35.33	-26.00	-34.67
NC	Mean	14.00	12.97	14.06	13.87	14.10	13.20	12.18	11.64	12.87	10.94	12.16	12.45	10.93	13.19	11.21
	Min		4.00	5.00	5.00	4.00		4.00	4.00	5.00	5.00		4.00	3.00	3.00	2.00
	Max		24.00	34.00	28.00	29.00		27.00	21.00	29.00	23.00		32.00	21.00	30.00	22.00
	Her		39.70	64.85	32.49	49.37		49.99	17.29	56.19	11.89		39.71	6.70	54.45	43.25
	% deviation		-7.36	+0.43	-0.93	+0.71		-7.73	-11.82	-2.50	-17.12		+2.38	-10.12	+8.47	-7.81
PC	Mean	5.00	4.51	4.41	4.32	4.18	5.40	5.18	5.12	5.21	5.04	4.16	3.89	3.69	4.01	3.91
	Min		2.00	3.00	2.00	3.00		2.00	3.00	2.00	3.00		2.00	2.00	2.00	2.00
	Max		6.00	6.00	6.00	5.00		8.00	8.00	9.00	10.00		7.00	6.00	7.00	7.00
	Her		78.24	56.11	66.74	40.64		34.06	36.32	46.90	48.17		54.03	44.44	59.25	57.80
	% deviation		-9.80	-11.80	-13.60	-16.40		-4.07	-5.19	-3.52	-6.67		-6.49	-11.30	-3.61	-6.01

**Supplementary Table 2.** Estimates of mean values, range, broad sense heritability ( $h^2_b$  %) for eight yield-related traits in the M<sub>2</sub> generation of blackgram cultivars viz., ADT3, CO6 and TU 17-9

Varieties		cv. ADT3					cv. Co 6					cv. TU 17-9				
Traits	Treatments Parameters	Control (CV1)	200 Gy (A1)	300 Gy (A2)	400 Gy (A3)	500 Gy (A4)	Control (CV2)	200 Gy (C1)	300 Gy (C2)	400 Gy (C3)	500 Gy (C4)	Control (CV3)	200 Gy (T1)	300 Gy (T2)	400 Gy (T3)	500 Gy (T4)
NPP	Mean	38.00	37.63	36.72	36.61	39.01	42.30	36.20	33.36	38.33	29.49	33.58	29.22	24.83	32.53	25.65
	Min		10.00	14.00	17.00	10.00		11.00	3.90	11.00	11.00		11.00	5.00	6.00	4.00
	Max		80.00	101.00	85.00	102.00		76.00	70.00	102.00	58.00		69.00	57.00	92.00	60.00
	Her		63.71	68.51	44.14	71.66		83.12	76.31	88.73	62.09		44.86	11.32	61.65	37.39
	% deviation		-0.97	-3.37	-3.66	+2.66		-14.42	-21.13	-9.39	-30.28		-12.98	-26.06	-3.13	-23.62
PL	Mean	5.30	4.42	4.41	5.13	5.23	4.46	4.10	4.23	4.15	4.06	5.73	3.96	3.85	4.03	3.88
	Min		3.40	1.60	4.00	4.00		3.60	3.20	3.20	3.00		3.20	2.90	3.00	2.60
	Max		5.20	5.00	6.00	7.00		5.20	5.00	5.20	4.80		4.80	4.40	4.90	4.80
	Her		31.34	63.42	49.96	60.11		20.48	28.93	31.69	36.47		31.52	26.70	30.28	50.09
	% deviation		-16.60	-16.79	-3.21	-1.32		-8.07	-5.16	-6.95	-8.97		-30.89	-32.81	-29.67	-32.29
NS	Mean	7.00	7.02	6.32	6.95	7.05	6.60	6.59	6.70	6.40	6.35	6.25	6.34	6.09	6.39	6.17
	Min		4.00	3.00	5.00	5.00		4.00	5.00	4.00	4.00		4.00	4.00	4.00	3.00
	Max		8.00	8.00	10.00	10.00		8.00	8.00	8.00	8.00		8.00	7.00	8.00	8.00
	Her		59.96	64.91	78.20	80.17		45.22	55.25	57.42	64.68		40.64	31.93	16.47	63.26
	% deviation		+0.29	-9.71	-0.71	+0.71		-0.15	+1.52	-3.03	-3.79		+1.44	-2.56	+2.24	-1.28
SPY	Mean	8.70	7.74	7.48	6.96	7.52	9.21	7.13	7.08	7.02	5.38	8.79	6.03	5.03	6.98	4.81
	Min		1.85	2.30	2.41	1.84		3.13	1.33	1.08	1.95		1.31	0.43	0.49	0.55
	Max		16.71	15.77	14.45	19.61		17.99	13.99	19.57	11.20		17.31	15.31	20.61	11.03
	Her		94.21	92.11	89.49	94.11		85.58	80.36	87.44	61.32		79.33	69.21	82.58	64.74
	% deviation		-11.03	-14.02	-20.00	-13.56		-22.58	-23.13	-23.78	-41.59		-31.40	-42.78	-20.59	-45.28

**Supplementary Table 3.** Estimates of mean values, range, broad sense heritability ( $h^2_b$  %) for eight yield-related traits in the  $M_3$  generation of blackgram cultivars viz., ADT3, CO6 and TU 17-9 (continued)

Varieties		cv. ADT 3					cv. Co 6					cv. TU 17-9				
Traits	Treatments Parameters	Control (CV2)	200 Gy (A1)	300 Gy (A2)	400 Gy (A3)	500 Gy (A4)	Control (CV2)	200 Gy (C1)	300 Gy (C2)	400 Gy (C3)	500 Gy (C4)	Control (CV3)	200 Gy (T1)	300 Gy (T2)	400 Gy (T3)	500 Gy (T4)
PH	Mean	33.30	24.92	24.04	21.66	21.32	27.00	27.22	26.36	24.62	24.52	19.00	34.58	30.37	29.64	30.63
	Min		12.00	13.00	13.00	13.00		14.00	15.00	12.00	13.00		21.00	20.00	21.00	20.00
	Max		42.00	42.00	30.00	33.00		60.00	50.00	44.00	46.00		50.00	42.00	42.00	55.00
	Her		84.82	78.18	65.74	68.50		76.12	67.59	59.77	57.64		86.87	78.39	80.10	84.86
	% deviation		-25.17	-27.81	-34.95	-35.98		0.81	-2.37	-8.81	-9.19		82.00	59.84	56.00	61.21
NB	Mean	3.40	2.60	2.22	1.90	2.02	2.60	2.56	2.76	2.76	2.34	3.20	2.32	2.04	2.46	2.41
	Min		1.00	1.00	0.00	0.00		0.00	1.00	1.00	1.00		0.00	0.00	1.00	0.00
	Max		6.00	5.00	4.00	5.00		8.00	6.00	6.00	5.00		6.00	4.00	6.00	5.00
	Her		70.25	62.13	59.57	58.63		78.62	74.81	74.95	66.26		79.33	64.48	68.57	78.62
	% deviation		-23.53	-34.71	-44.12	-40.59		-1.54	6.15	6.15	-10.00		-27.50	-36.25	-23.13	-24.69
NC	Mean	8.40	8.42	8.94	8.20	8.44	11.20	11.48	12.62	10.02	10.22	10.60	10.98	8.73	9.72	12.20
	Min		3.00	3.00	3.00	3.00		5.00	4.00	3.00	3.00		4.00	2.00	2.00	3.00
	Max		21.00	19.00	20.00	21.00		24.00	30.00	18.00	18.00		26.00	21.00	24.00	38.00
	Her		69.83	59.75	47.59	77.34		71.90	69.25	61.42	62.11		75.64	62.94	75.71	76.93
	% deviation		0.24	6.43	-2.38	0.48		2.50	12.68	-10.54	-8.75		3.58	-17.64	-8.30	15.09
PC	Mean	2.10	2.34	2.36	2.34	2.56	2.70	2.84	2.82	2.88	2.64	2.80	2.72	2.43	2.50	2.72
	Min		2.00	2.00	2.00	1.00		2.00	2.00	2.00	2.00		1.00	1.00	1.00	2.00
	Max		3.00	3.00	4.00	4.00		4.00	4.00	4.00	4.00		4.00	4.00	4.00	4.00
	Her		63.03	59.45	60.89	77.14		82.70	84.67	37.97	80.26		81.90	75.56	83.58	79.29
	% deviation		11.43	12.38	11.43	21.90		5.19	4.44	6.67	-2.22		-2.86	-13.21	-10.71	-2.86

**Supplementary Table 3.** Estimates of mean values, range, broad sense heritability ( $h^2_b$  %) for eight yield-related traits in the  $M_3$  generation of blackgram cultivars viz., ADT3, CO6 and TU 17-9

Varieties		cv. ADT 3					cv. Co 6					cv. TU 17-9				
Trait s	Treatments	Contro l (CV1)	200 Gy (A1)	300 Gy (A2)	400 Gy (A3)	500 Gy (A4)	Contro l (CV2)	200 Gy (C1)	300 Gy (C2)	400 Gy (C3)	500 Gy (C4)	Contro l (CV3)	200 Gy (T1)	300 Gy (T2)	400 Gy (T3)	500 Gy (T4)
NPP	Mean	16.30	15.82	17.63	16.78	18.88	27.00	26.72	27.50	22.98	22.08	22.60	25.78	18.71	22.00	27.74
	Min		5.00	5.00	8.00	5.00		9.00	11.00	7.00	5.00		7.00	5.00	2.00	7.00
	Max		46.00	46.00	36.00	53.00		67.00	52.00	51.00	42.00		60.00	56.00	77.00	75.00
	Her		79.43	80.55	60.98	85.17		82.58	63.78	69.38	64.25		81.49	61.64	79.92	79.31
	% deviation		-2.94	8.16	2.94	15.83		-1.04	1.85	-14.89	-18.22		14.07	-17.21	-2.65	22.74
PL	Mean	5.39	4.66	4.70	4.54	4.60	4.25	4.47	4.42	4.51	4.67	4.12	4.34	4.54	4.55	4.62
	Min		3.20	2.50	2.40	2.70		2.40	3.20	3.00	3.10		3.30	3.10	3.10	3.40
	Max		6.40	5.60	5.60	6.10		6.10	5.30	5.50	6.50		5.60	5.60	6.20	5.90
	Her		80.73	77.02	80.81	80.19		89.67	65.91	80.88	87.89		65.32	77.68	74.35	60.20
	% deviation		-13.54	-12.80	-15.77	-14.66		5.18	4.00	6.12	9.88		5.34	10.19	10.44	12.14
NS	Mean	5.70	6.22	6.32	6.22	6.32	6.40	5.94	5.90	6.64	6.78	6.60	6.16	6.10	5.96	6.28
	Min		5.00	4.00	5.00	4.00		4.00	3.00	5.00	5.00		4.00	4.00	4.00	5.00
	Max		8.00	7.00	7.00	8.00		7.00	7.00	9.00	9.00		7.00	8.00	8.00	8.00
	Her		75.79	78.27	64.94	79.58		66.42	60.53	81.87	76.51		63.52	75.34	61.87	63.52
	% deviation		9.12	10.88	9.12	10.88		-7.19	-7.81	3.75	5.94		-6.67	-7.58	-9.70	-4.85
SPY	Mean	1.65	1.31	1.83	2.03	3.14	2.24	5.11	4.92	3.71	3.32	4.10	2.02	2.29	2.78	3.36
	Min		0.06	0.26	0.53	0.39		1.39	0.99	0.44	0.60		0.08	0.19	0.12	0.87
	Max		4.98	5.27	5.33	8.07		17.03	10.79	9.98	7.15		6.17	8.99	10.56	9.46
	Her		74.10	81.66	76.28	92.40		87.39	85.69	81.65	69.77		62.37	67.65	80.54	77.50
	% deviation		-20.61	10.91	23.03	90.30		128.13	119.64	65.63	48.21		-50.73	-44.15	-32.20	-18.05

**Supplementary Table 4.** Contribution of varying gamma doses/irradiation causing distinct morphological mutations in M<sub>2</sub> generation

Type of mutants	cv. ADT 3				Total	cv. Co 6				Total	cv. TU 17-9				Total
Radiation doses	200 Gy	300 Gy	400 Gy	500 Gy		200 Gy	300 Gy	400 Gy	500 Gy		200 Gy	300 Gy	400 Gy	500 Gy	
M <sub>2</sub> plant examined	1440	1363	1034	1026	4863	1371	1200	1124	871	4566	608	579	410	399	1996
Tall	-	4	-	1	5	-	-	1	1	2	-	2	2	-	4
Dwarf	-	-	-	1	1	1	-	2	-	3	-	-	-	-	0
Erect stem	1	2	-	-	3	-	-	-	-	0	6	4	5	-	15
Spreading stem	-	-	-	1	1	-	1	-	-	1	-	-	-	-	0
Open type stem	-	1	1	-	2	-	-	-	-	0	-	-	-	-	0
Green stem	-	-	1	-	1	-	-	-	-	0	-	-	-	1	1
Pink stem	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0
Branching pattern changed	-	-	-	-	0	-	-	3	-	3	-	-	-	-	0
Crinkled & leathery leaf	-	1	2	1	4	-	-	-	-	0	-	-	-	-	0
Narrow leaf	-	3	-	-	3	-	1	-	-	1	1	1	-	-	2
Ovate leaf	-	2	-	-	2	-	-	-	-	0	-	-	-	-	0
Pink margin leaf	-	-	1	1	2	-	-	-	-	0	-	-	3	-	3
Single foliate leaf	-	-	1	-	1	-	-	-	-	0	-	-	-	-	0
Early maturity	-	3	1	2	6	2	4	-	-	6	1	1	-	4	6
Glaborous	-	-	1	-	1	-	-	-	-	0	-	-	-	-	0
Hairy pods	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0
Increased pods numbers	14	11	6	9	40	10	6	7	5	28	3	4	3	4	14
Increased pod length	1	1	2	-	4	-	-	2	1	3	1	-	-	-	1
Short pods	1	2	1	-	4	1	-	1	1	3	-	-	-	-	0
Pod colour changed	-	1	1	1	3	-	-	-	3	3	-	-	-	-	0
Bold seeds	1	-	-	-	1	2	3	2	-	7	-	-	-	-	0
Small seeds	2	-	-	-	2	-	-	-	-	0	-	-	-	-	0
Brown seeds	-	1	1	-	2	-	-	-	1	1	-	-	-	1	1
Sterile plant	1	-	-	-	1	-	-	-	-	0	-	-	1	-	1
Leafy plant	-	-	-	1	1	-	-	1	-	1	-	-	-	-	0
Total	22	32	19	18	91	16	15	19	12	62	12	12	14	10	48
Frequency (%)	1.53	2.35	1.84	1.76	7.48	1.17	1.25	1.69	1.38	5.49	1.97	2.07	3.41	2.51	9.96

**Supplementary Table 5.** Contribution of varying gamma doses/irradiation causing different morphological mutations in M<sub>3</sub> and M<sub>4</sub> generations

Radiation doses	M <sub>3</sub>					M <sub>4</sub>				
	200 Gy	300 Gy	400 Gy	500 Gy	Total	200 Gy	300 Gy	400 Gy	500 Gy	Total
cv. ADT3	58	52	64	82	256	5	4	5	7	21
cv. Co6	45	47	42	38	172	2	2	3	1	8
cv. TU17-9	28	31	35	21	115	1	1	2	3	7
Total	131	130	141	141	543	8	7	10	11	36