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Seed purpose watermelon - a livelihood security option for rainfed mixed Cropping in Western Rajasthan

Watermelon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai) is grown as a cash crop during summer months in plains of North India under assured irrigation or on conserved moisture in *Indo-Gangetic* plains for its edible fresh fruits. In north-western parts of the Indian arid zone where it is popularly known as '*Mateera*' or '*Kalingada*' it is mainly cultivated for its high priced seeds. Here it is an integral component of rainfed traditional farming system and is grown along with pearl millet and clusterbean (Plate 1) as a mixed crop.

The average productivity of pearl millet and or clusterbean in the arid region is very low (300 - 500 kg ha⁻¹) and variable over the years depending on quantity and distribution of rainfall during crop growing period. High wind velocity (20 - 25 km h⁻¹) just after sowing is one of the main reasons of low productivity of these crops. Further, initial prolonged dry spell (20-25 days) results in uneven germination and hinders optimum plant stand. This situation offers space for *Mateera* vines under rainfed mixed cropping as initially they grow faster than clusterbean/pearl millet. By and large 100 - 125 *Mateera* vines easily get space under sub-optimum or below normal rainfall situations and could provide 50 - 60 kg *mateera* seed yield per hectare besides grain yield of main crop (Pearl millet/clusterbean).



Plate 1. Traditional cultivation of *Mateera* with guar under rainfed conditions

This increases the system productivity without any extra input/resources and is hence a more sustainable system under climatic vagaries. Sometimes farmer earns higher returns from *Mateera* seeds (subsidiary crop) than main kharif crops.

'*Mateera*' seed price varies from Rs. 5000 - 8000 per quintal (sometimes \geq Rs. 10000) in local market, which is remunerative among rainfed kharif crops thus supporting the livelihood in a big way (Plate 2). Its roasted seeds are taken as a common snack and is also used in sweets and pharmaceuticals after removal of seed coat. The seed contains 30 - 35 per cent oil and 20 - 25 per cent crude protein besides iron and zinc in appreciable quantity. The seeds are supposed to regulate blood sugar levels, increase energy, maintain the nervous system and promote healthy skin. Moreover, after

seed extraction, its rind portion locally known as 'Khuparia' can be very well utilized as animal feed since it improves the quality and quantity of milk and animal health also. On dry weight basis Khuparia contains 12-15 per cent crude protein, 22 - 30 percent ether extract and 9-14 percent ash (Plate 3).

Evaluation of *Mateera* for high seed yield

Farmers prefer *Mateera* as a component of mixed cropping due to low and erratic rainfall and adverse conditions, but there is unavailability of improved varieties of *Mateera* for seed purpose. In view of this, improvement programme of *Mateera* for seed purpose was started at Central Arid Zone Research Institute, Regional Research Station, Jaisalmer. More than 100 watermelon genotypes from India and abroad were evaluated between 2009 to 2012 under rainfed condition. The preliminary evaluation during kharif 2010 revealed wide variability for seed yield and related traits (Table 1) which offered great scope for further improvement through systematic breeding approach.



Plate 2. Farmer family extracting seeds from *Mateera* fruits



Plate 3. Dry rind portion of *Mateera* after seed extraction (fresh rind in inset)

Table 1. Variability for quantitative traits in watermelon germplasm

Character (s)	Mean \pm SE _m	Range	Coefficient of variation (%)
Fruit weight (g)	1493.8 \pm 79.82	464 - 5635	57.05
Rind weight (g)	986.5 \pm 54.76	295 - 3152	59.27
Fruit diameter (cm)	43.8 \pm 0.61	28.8 - 65.8	14.84
Fruits per plant (no.)	7.6 \pm 0.38	2.02 - 27.25	53.59
Fruit yield per plant (kg)	13.2 \pm 0.61	1.08 - 34.5	49.34
Seeds per fruit (no.)	499.8 \pm 19.70	156.4 - 1072.0	42.08
Seed yield per fruit (g)	40.65 \pm 1.05	18.53 - 66.49	27.53
Seed yield per plant (g)	273.62 \pm 13.85	25.0 - 870.0	54.03
Test weight (g)	93.85 \pm 3.60	45.81 - 191.88	40.93
Oil content (%)	28.9 \pm 0.38	14.6 - 44.2	14.02



Plate 4. Farmers visiting experimental site during *Mateera* Field Day

The promising genotypes selected for seed yield were further evaluated during kharif 2011 (Table 2). Among the selected promising genotypes number of fruits ranged from 5.5 - 15.1 and seed yield from 163.3 - 387.5 g per plant. The fruit yield and seed yield ranged from 212 - 363.8 and 5.6 - 9.6 quintal per hectare, respectively under rainfed conditions (265 mm rainfall in 15 rain events during crop growing period from July to September). Thus, when grown as a sole crop under rainfed conditions may provide gross income of Rs. 25,000 - 45,000 from the *mateera* seeds while rind portion could be utilized as a quality feed for animals.

Table 2. Performance of promising genotypes of watermelon during kharif 2011

Entry	Fruits plant ⁻¹ (no.)	Fruit yield (q ha ⁻¹)	Seed yield plant ⁻¹ (g)	Seed yield (q ha ⁻¹)
SKNK-1001	10.6	337.9	387.5	9.5
SKNK-1003	10.6	239.5	167.8	6.2
SKNK-1004	5.9	212.0	315.5	5.6
MK-81-1	6.6	252.5	201.7	6.7
MK-45-3	5.5	363.8	217.5	7.2
SKNK-0901	8.4	229.6	219.0	7.3
SKNK-0902	11.6	249.1	163.3	6.4
SKNK-0903	14.7	280.4	317.5	9.6
MGPK-1	12.3	253.0	263.2	8.8
SKNK-806	10.0	293.8	242.5	8.1
SKNK-807	15.0	228.0	196.3	6.5
CZJK-10-1	8.3	260.6	232.7	8.8
GK-1 (C)	15.1	274.0	289.5	8.6
CD (5 %)	0.7	26.6	47.4	0.8

On farm testing of promising genotypes of *Mateera*

Seeds of promising genotypes of *Mateera* were provided to farmers of Jaisalmer district for sowing with clusterbean/pearlmillet for their performance. The yield data of crops/*Mateera* from the farmers field (Table 3) showed substantial increase in net returns with improved *Mateera* genotypes under rainfed conditions. The demonstrations executed at farmers field clearly showed that if improved genotypes of *Mateera* having higher seed yield potential introduced with main crop instead of traditional *Mateera* seed at the time of crop sowing, it could provide additional income of Rs. 5830 with pearlmillet and Rs. 4550 with clusterbean per hectare.

Considering the potential, need was felt to organize *Mateera* field day (Plate 4) to popularize the high seed yield genotypes for increasing productivity and

Table 3. Seed yield of pearlmillet, guar and *Mateera* under rainfed conditions of Jaisalmer

Crop and their sowing combination	Grain yield (kg ha ⁻¹)	<i>Mateera</i> seed yield (kg ha ⁻¹)	Additional income from <i>Mateera</i> seeds (Rs.)	Net income over sole crop (Rs.)
Sole Pearlmillet	350	-	-	-
Sole Guar	205	-	-	-
Pearlmillet + Desi <i>Mateera</i>	320	35	1750	1390
Pearlmillet + Improved <i>Mateera</i>	315	125	6250	5830
Guar + Desi <i>Mateera</i>	185	50	2500	800
Guar + Improved <i>Mateera</i>	180	135	6750	4550

Sale price of Pearlmillet grain Rs. 12.0/kg, guar grain Rs. 100.0/kg and *Mateera* seed Rs. 50.0/kg

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World Environment Day, 2013

The ENVIS Centre at CAZRI celebrated the World Environment Day on 5th June. Dr. Ram Gopal, Ex Director, Defence Laboratory, Jodhpur delivered a lecture on the theme "Think.Eat.Save" at this occasion. Dr. M.M. Roy, Director, CAZRI, presided over the function. Dr. Depankar Saha, Sr. Scientist welcomed the guests. Shri Tirth Das, ENVIS Coordinator proposed the Vote of thanks.

World Day To Combat Desertification, 2013

The Center celebrated the World Day To Combat Desertification on 17th June by organizing a lecture. The speaker Dr. L.N. Harsh, Ex Principal Scientist, CAZRI, Jodhpur delivered a lecture on the theme "Drought and Water Scarcity". Dr. A.K. Mishra, I/C Director, CAZRI, presided over the function. Convener Dr. Mahesh Kumar Gaur, Sr. Scientist welcomed the Chief Guests and participants. Shri Tirth Das, ENVIS Coordinator proposed the Vote of thanks.

Forthcoming Conferences and Events

The Borlaug Global Rust Initiative 2013 Technical Workshop from 19 to 22 August 2013 at New Delhi. Contact: <http://www.cvent.com/events/2013-bgri-technical-workshop/event-summary-a4c45e8e70d444fb9b4bc28b90a628e2.aspx>

American Geophysical Union (AGU) Chapman Conference 2013 on post-Wildfire from 25 to 30 August 2013 at Colorado. Contact: <http://www.unspider.org/event/6649/2013-08-25/american-geophysical-union-agu-chapman-conference-2013-post-wildfire>

EnviroInfo 2013 from 02 to 04 September 2013 at Hamburg Contact: <http://www.enviroinfo2013.org>

United Nations/Indonesia International Conference on Integrated Space Technology Applications to Climate Change from 02 to 04 September 2013 at Jakarta. Contact: <http://www.unspider.org/climatechangeconference>

7th International Conference of the Urban Soils Working Group, SUITMA from 16 to 23 September 2013 at Torun, Poland. <http://www.suitma7.umk.pl/>

XXXIII INCA in International Congress on Integrated Decentralized Planning: Geospatial Thinking, ICT & Good Governance from 19 to 21 September 2013 at Jodhpur, Rajasthan. Contact: www.cazri.res.in

Training: Ecosystem-based Disaster Risk Reduction from 24 to 27 September 2013 at Maharashtra Contact: <http://www.unspider.org/event/6744/2013-09-24/training-ecosystem-based-disaster-risk-reduction>

First International Conference on Global Food Security from 29 September 2013 to 02 October 2013 at Noordwijkerhout, The Netherlands. Contact: <http://www.globalfoodsecurityconference.com/>

United Nations International Conference on Disaster Risk Identification, Assessment and Monitoring from 23 to 25 October 2013 at Beijing. Contact: <http://www.un-spider.org/event/6679/2013-10-23/united-nations-international-conference-disaster-risk-identification>

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