

Mateera – An underutilized cucurbit vegetable of Indian desert

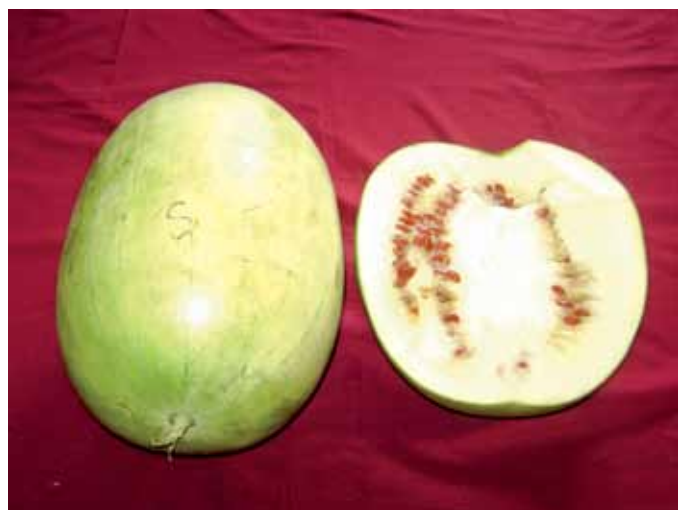
Mateera is an under-utilized, drought tolerant and native form of watermelon. It is grown in rainfed areas and its fruits are liked by desert dwellers. Nutritionally rich tender fruits are used for vegetable and ripened for dessert. Fruits and seed-kernel are sold at premium price. From 1994, ICAR-CIAH has undertaken intensive research for germplasm conservation and utilization in varietal development. On evaluation of wide range of *Citrullus* germplasm, watermelon genotypes failed to express their potential under the high temperature conditions. Therefore, promotion of varieties from native germplasm is beneficial and recommended for commercial cultivation under resource constrained arid region. The developed varieties such as AHW-19 and Thar Manak are early to harvest, producing better quality fruits suitable for multiple-use.

NATIVE and drought tolerating cucurbits such as kachri, kakadia, mateera, tinda and tumba are components of traditional mixed cropping and play a significant role in providing nutritious food and income to inhabitants of desert eco-system. Non-availability of crop-specific genotypes suited to environmentally stressed production sites is a major limiting factor in vegetable promotion under hot arid climate of Rajasthan. Mateera is of multiple-use and CIAH technology is much useful to the farmers for getting benefits as loiya, seed, as well as rainfed, off-season, organic, low-input and less-water cultivation of this crop-commodity.

Drought tolerant mateera

Mateera is an indigenous form and drought tolerating

watermelon (*Citrullus lanatus*). It is widely grown in north-western part of India particularly in arid region of Rajasthan during *kharif*. Mouth appeal of mateera fruit is attributed to sweet taste, aroma and refreshing edible pulp. Ripen fruits are consumed fresh as dessert-salad and have juicy and cooling pulp. Tender fruits weighing 100 g (loiya) are used extensively for vegetable culinary and *raita*. Loiya is rich in nutrition and 100 g fresh weight contains 96.3% moisture and 3.7% dry matter. On percent basis, dry matter contains carbohydrate (35.71), protein (12.15), fat (18.25), crude fibre (25.4), calcium (5.8), phosphorus (0.18) and trace elements (3.3). Seed are protein rich (25–32%), roasted and eaten as snacks. Seed also yield nutritive oil (30–40%). Seed kernels (magaz) is extracted on large-scale and used in sweets, bakery and ice-creams. Rind of ripen



Fruit characters of high seed yielding mateera selection
AHW-RSS-1



Fruit characters of multiple-use mateera mutant
AHW-BSM-1



Fruits of mateera variety AHW-19 for rainfed cultivation



High quality fruit yielding mateera variety Thar Manak for round the year cultivation

fruits is pickled or turned into sugar-candy (tuty-fruity), and used as animal feed too.

Why mateera cultivation in arid region?

For production of mateera, farmer's broad-cast its seeds with mixed cropping of bajra or arid legumes. With good monsoon rains, farmer's collected mateera fruits during October-November and it is the period of harvesting *kharif* crops and fruits ensure some income as bonus. In recent years, its cultivation is also popular as sole or inter-crop of orchards. Now, it is grown as irrigated crop in particular for loiya production under extremes of high temperature conditions.

Due to the non-availability of drought tolerant mateera varieties in the recent past, farmers of the region used heterogeneous and mixed seed collected from cross-pollinated crop and it is based on sweetness of fruit. Intensive study on flesh characters of open-pollinated mateera crop was done at farmers' fields, and it was concluded that hardly 10% fruits are of marketable quality. With such seeds, there is no guarantee of fruit quality before it is used. Thus, absence of varieties in native mateera, productivity and quality is much variable and poor. Consequently, it fetches low market price and marginal returns to the growers.

Likewise, commercial watermelon varieties and hybrids (Durgapura Meetha, Arka Manik, Sugar Baby, Charleston, Mahobobi, Arka Jyoti, etc) need high and frequent irrigation, have poor yield and suffer from fruit cracking under high temperature conditions in summers. In rainy season, these genotypes exhibit poor fruit quality and high level of viral complex in plants, and cannot grow under rainfed situation.

Breeding for marketable quality fruits in mateera

Realizing the importance of drought tolerant and multiple-use mateera in the Indian desert and potentialities to extend its period of fruit availability (April to November) time called for concerted research. Looking at this, systematic work-plan on mateera improvement was taken since 1994 with objective to develop standard varieties for uniform and quality fruit production including dessert-salad, loiya and high seed content. To fulfill this, intensive surveys were conducted from 1994 to 2002 in arid and semi-arid areas of Rajasthan and wide range of genetic variability was collected in *Citrullus* species at CIAH. The collected germplasm was characterized, evaluated and utilized in improvement programme over the years (1995 to 2010) and also conserved at national gene-bank.



Tender fruits (loiya) of drought tolerant mateera for vegetable culinary



High protein and edible oil rich mateera seed-kernels



Channel technology of mateera cultivation



Field view of mateera crop in fruit bearing

A wide range of variability was recorded with respect to growth, flowering, fruiting, maturity, quality and seediness besides tolerance towards biotic and abiotic factors. During characterization, *Citrullus* germplasm was categorized based on economical traits and promising type such as AHW-18, AHW-19, AHW-65, AHW-108, AHW-140, AHW-RSS-1 and AHW-BSM-1 were identified. Besides, two high yielding selections namely AHW-19 and AHW-65 were developed and released in 1998 for immediate gains and growers accepted them for uniform harvest under rainfed conditions.

However, two essential traits of commercial watermelon i.e. eye-appealing flesh quality and sweetness were not materialized in mateera varieties developed by the institute. Therefore, intensive breeding work was done involving AHW-19, AHW-65, Sugar Baby, Durgapura Meetha, Charleston and Mahobobi. A large number of progenies were generated using selected parents in combinations (F_1 , F_2 , BC_1 , BC_2 and bi-parental) and evaluated. Four prioritized traits such as flesh quality, earliness, tolerant to cracking and yield behaviour under high temperature ($>40^\circ\text{C}$) situations were kept to screen the progenies. In F_6 generation, few progenies of cross combination of AHW-19 $\times$ Sugar Baby exhibited desirable trend for fruit flesh (colour, firmness, content and TSS) and yield.

Fruit quality and yield potential of advanced family $F_6/a/10$ was much superior and highly acceptable depicting internally as good as Sugar Baby and rind characters as mateera. This was further advanced under isolation and open pollinated progeny designated as F_6/a (Thar Manak) and released during 2007. The developed variety is devoid of cracking and suitable for summer and rainy season cultivation under hot arid climate.

AHW-19

It is multiple-use and rainfed growing selection. Female flowers start at 45 days and tender fruits (loiya) are available from 58 days of sowing. Ripen fruits are ready for first harvesting at 75-77 DAS, and 3.8-4.1 kg in weight, 30-33 cm in length and 60-65 cm in girth. Oblong shape fruits have dark green in clear stripes on smooth rind. It bears 3.1-3.4 ripen fruits/plant and yield is 192-386 q/ha. Flesh is pink, firm having good taste and

8.0-8.4% sweetness. High in seeds, 489-527 number/fruit and weight of 100 seeds is 9.12-9.27 g. Seed is bold and khaki in colour.

Thar Manak

It is widely acceptable fruit quality selection and tolerant to drought, high temperature and abiotic stressed conditions. It is through hybridization from cross combination of AHW-19 $\times$ Sugar Baby. It is early in first harvesting (75 DAS) and high yielding (185-355 q/ha). Ripen fruits are oblong-round with dark green-green stripes on smooth rind. Fruits weigh 2.65-4.21 kg and are 20-22 cm in length and 58-62 cm in girth, and free from cracking. Flesh is attractive, reddish, firm, granular and have 9.5-11.2% TSS. Seeds are very big, bold, black and low (160-266 number/fruit). It is suitable for summer and rainy season irrigated crop and also rainfed cultivation during *khari*f.

AHW-RSS-1

It is trait specific selection from native germplasm and high seed yielding under rainfed conditions. It is a short duration selection, fruit harvesting starts from 80 days and vine bears approximately 3.2 mature fruits. Fruit is big and oblong shape with no stripes, light green and smooth rind. Ripen fruits are 7.9 kg in weight, 32 cm in length and 68 cm in girth. Edible flesh firm but white in colour. Fruits are very high in seeds (950-1120 number) and weight of 100 seeds is 9.8 g. Seed is big, bold and reddish in colour.

Production technology

Now, drought tolerant mateera varieties are in attraction for loiya, seed-kernels and ripen fruits too. These can be successfully grown by sowing in June-July and February-March. Onset of monsoon rains is the best for sowing rainfed crop in arid area. Selected field should be prepared as per topography of sand-dune landscape at the production site. Deep-furrow, channel and drip technology as standardized at CIAH is simple for mateera cultivation. In thoroughly developed and lay-out plot, 1.5-2.0 m apart and 50 cm wide channels or deep-furrows are prepared, or laterals also laid-down for drip technology, which are 25 m in length on one-side of water delivery-line. Prior to sowing, furrows or channels of

1 hectare area is manured and fertilized with FYM (50 q), vermin-compost (5 q), DAP (100 kg), SSP (100 kg), urea (50 kg), MOP (50 kg) and 10 kg neem-leaf powder and mixed thoroughly. For drip, furrows / channels are converted into seed-bed and lateral-pipes fixed in centre.

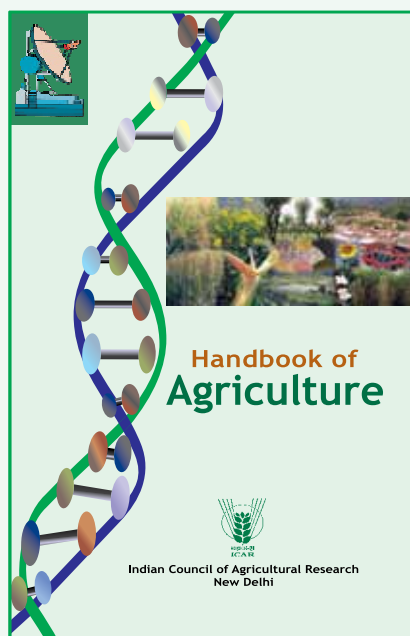
About 2 kg seed is enough for sowing 1 hectare area. Prior to sowing, seed should be soaked in water for 5–6 hours and also treated with fungicide. Seed should be sown at 50 cm distance at inner-down slope of the channel, centre-line of furrow or near to drippers of lateral-line. At each sowing point, 3–4 seeds should be sown and 1–2 healthy plants are allowed. Thinning of seedling is done at 18–21 days from sowing or when they attain 2–4 true-leaf stage. The crop should be irrigated at 6–8 days intervals by flood method only in the channels or at 2–3 days for 1.5–2.0 hours with drip (lateral 16 mm and 4 lph in-line emitters) under sandy soil. Manual hoeing and weeding is done at 18–21, 28–30 and 40–45 days from sowing and at this time,

urea @ 50 kg/ha is applied in 2–3 split-doses. Spraying of insecticide such as imidachloropid (0.3 ml/l), di-methoate and malathion (1.5 ml/l) to manage aphid, thrips, jassid, white-fly and minor insect-pests is recommended at very early plant-growth, flowering and fruit setting stages. For genetically pure seed production, isolation distance of about 500 m is sufficient between the varieties of mateera, watermelon and tumba. Integration of inter-culture operations, spraying, roughing and monitoring is beneficial. Protection measure from birds and wild animals is also required.

For further interaction, please write to:

A K Verma (Scientist), ICAR-Central Institute of Arid Horticulture, Beechwal, Bikaner, Rajasthan 334 006. *Corresponding author's email: ajayhorti19@gmail.com

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TECHNICAL SPECIFICATIONS

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