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Our Products



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Jodhpur - 342 003 India



June 2008

Publisher

Director
Central Arid Zone Research Institute
Jodhpur 342 003

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Guggul



Peelu

OUR DESERT

India has 31.7 m ha hot arid area, of which 62% is in Rajasthan. This region with environmental adversities of low precipitation, erratic in distribution and extent, extremes of temperature in both summer and winter, high wind velocity and poor soil physical and fertility conditions has perennially low productivity. But this low yielding area has high human and animal population.

PRODUCTS FOR LIVELIHOOD

Traditional wisdom has therefore, evolved for ages for livelihood and judicious use of natural resources. Desertic trees, shrubs and grasses yield various products like gum, gel, seeds and fruits that in the raw form fetch low income. Likewise animal products such as milk are less remunerative. The active ingredients / constituents found as products and secondary metabolites from desert flora, fauna and micro flora evolved over centuries are unique and specific to this geographic region. To make these raw materials acceptable to National and International consumers, their value addition has been gaining momentum at CAZRI for last few decades.

Accordingly, a large number of products from plants, animals and locally available feeds as well as IPM and low cost user friendly tools have been developed. Some of the products are in the process of patenting.

VALUE ADDED PRODUCTS

Products from Date palm (*Khajoor*)

Date Jelly : Dates of doka stage are used. Easy preparation, attractive purple colour, pleasant smell. Low sugar base, no chemicals/additive preservatives. BC ratio 1.29.



Date Chutney : Dates of pind stage are used. Pleasant aroma, long preservation quality. BC ratio 1.5.



Date Pickle : Green or pind stage dates are used. Easy to prepare, long shelf life. BC ratio 1.29.

Date Toffee : Dates of doka stage are used. Low sugar base, no chemical, chocolate colour, granular texture with good elasticity; liked by children. BC ratio 1.43.



Products from Colocynth (*Tumba*)

Citrullus colocynthis locally known as *Tumba* is a natural perennial creeper of the desert. It has cucurbitacin beside 26.6% oil and 13.5% protein in seeds. Following value added products have been developed from *Tumba*.



Preserve: It is a source of desserts. Its production cost is Rs. 15 per kg and is sold at Rs. 30 per kg.

Pickle: Acts as laxative, supplies proteins, protective minerals and vitamins. Cost of product is Rs. 45 per kg. Return from product is Rs. 60 per kg.



Candy: Used in confectionary and desserts. Empty stomach intake lowers acidity and constipation. Candy making costs Rs. 15 per kg which can be sold at Rs. 30 per kg.



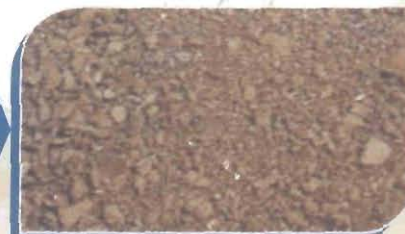
Churan: Appetizer, reduces acidity and constipation.



Roasted Seeds: Mouth freshener, reduces apocrine foul smell originating from armpits. Cost of product is Rs. 9 per kg. Return from product is Rs. 20 per kg.



Seed Cake: Good source of feed for milch animals. Also, a good source of NPK and Zn for crop plants.



Products from *Salvadora oleoides* (Meetha Jaal / Peelu)

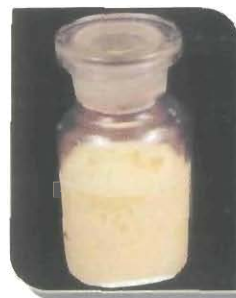
Peelu Jam: Prepared from fresh fruit pulp, this is consumed as table dish. BC ratio 2.0.



Peelu Squash: Made from fruit pulp, this soothing drink minimizes the risk of heat stroke during summer. BC ratio 2.0.



Dehydrated Peelu: Prepared by keeping in sulphur box for half an hour and transferring to a dryer at 50°C for 48 hrs to reduce its moisture level to 15%. BC ratio 1.54.



Peelu Fat: The seeds, available as by-product in the process of making *Peelu Squash* and *Peelu Jam*, can be profitably used for extraction of inedible fat (40-50%) that can be used in soap industry, candle making and also as a base in ointments. BC ratio 1.54.

Products from *Prosopis juliflora* (Vilayati Babool)

Biscuits: *Prosopis juliflora* pods are powdered and mixed with upto 25% wheat flour to make dough and baked to have crisp and tasty biscuits of pleasant flavour.



Products from *Haloxylon recurvum* (Khara-Lana)

Choa: It is also a mixed salt of sodium and potassium bicarbonate but of more refined form that fetches good market price up to Rs. 30 per kg. Both the products are used in *papad* industry. In Bikaner alone annual demand is 40 to 50 t. In saline wastelands farmer can get around Rs. 8000 to 10,000 per ha by growing *Khara-lana* with BC ratio of 1.4.



Saji: A mixed salt of sodium and potassium bicarbonate. In its crude form fetches Rs. 7 to 8 per kg.

Products from *Aloe vera* (*Gwar patha*)

Aloe Pickle: Natural attributes are retained, *Aloe vera* polysaccharides intact. Production cost is Rs. 10 per 100 g. BC ratio 1.5-2.5.

Aloe Gel: This is a moisturizer, suitable for summer, regular use may improve skin and hair condition. Production cost is Rs. 20 per 100 g. BC ratio 2.5-3.0.

Aloe Cold Cream: Highly effective for cracked feet, dry/dehydrated skin; moisturizes and softens the skin. Production cost is Rs. 50 per 100 g. BC ratio 1.7.

Aloe Moisturizer: Suitable for normal and oily skins, removes black spots from skin formed due to cold. Production cost is Rs. 30 per 100 g. BC ratio 1.8-2.5.

Aloe Candy: Edible product, natural attributes are retained, *Aloe vera* polysaccharides (AVPS) are present in concentrated form. Production cost is Rs. 50 per 100 g. BC ratio 2.5-3.0.

Aloe Jelly: Edible product, natural attributes are retained, AVPS is intact. Production cost is Rs. 20 per 100 g.



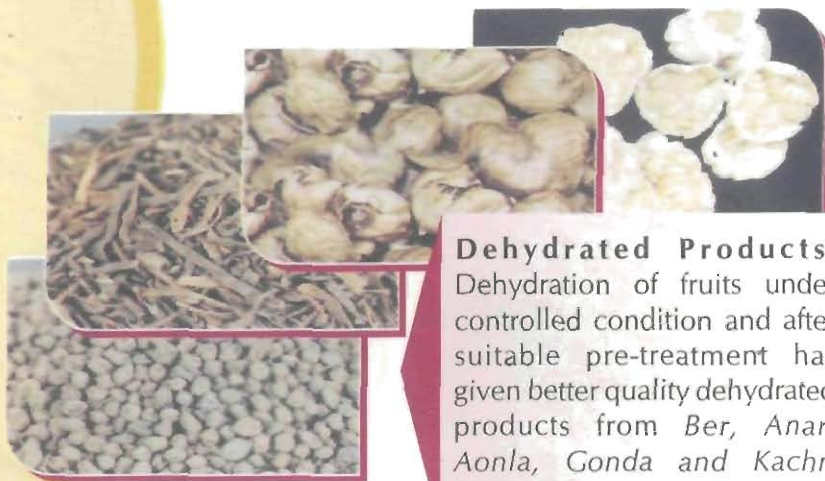
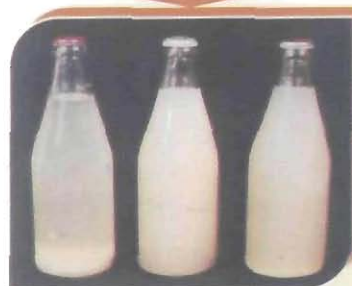
Products from Horticultural Plants

Squash: Blended fruit juice squash prepared from *Ber*, *Anar*, *Aonla*, and *Karonda* juice. Better quality due to natural colour and consumer acceptability as compared to squash prepared from single fruit juice. BC ratio 2.2.



Dehydrated Products: Dehydration of fruits under controlled condition and after suitable pre-treatment has given better quality dehydrated products from *Ber*, *Anar*, *Aonla*, *Gonda* and *Kachri* fruits. BC ratio 2.0.

Aonla Preserve and Candy: Sugar impregnated *Aonla* fruits in syrup (preserve) or without sugar syrup (candy) can be stored at ambient conditions. BC ratio 1.96.



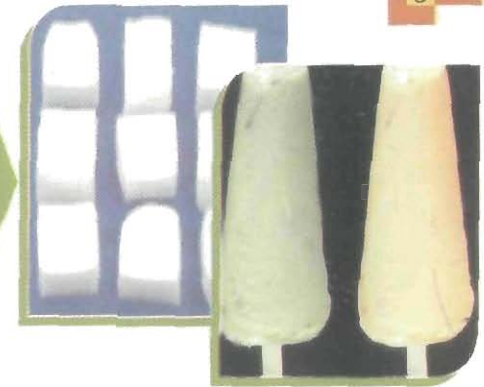
Products from Goat Milk

Goat milk has comparatively poor market owing to the goaty odour associated with it. Following products have been developed:

Paneer: Soft, compact and free from goat odour. Recovery 10-12%. BC ratio 1.69.

Kulfee: Nutritionally rich product, no goaty odour. BC ratio 1.7.

Whey Drink: Health drink, nutritionally superior for minerals, essential vitamins and high protein. It is a bonus byproduct of Paneer.



OTHER PRODUCTS

Products for Animal Feed



Complete Feed Blocks: Proportioned mixture of locally available fodder and concentrates to meet total nutritional needs of animals. Economical feed that is useful in drought affected areas. Cost of production is Rs. 4.50 per kg, which is being sold at Rs. 8 per kg.

Multi-nutrient Feed Block (MNB): Concentrated source of energy, protein and minerals fulfilling area specific nutrient needs of animals. Alleviates nutrient deficiencies and optimizes production.

Bioformulations

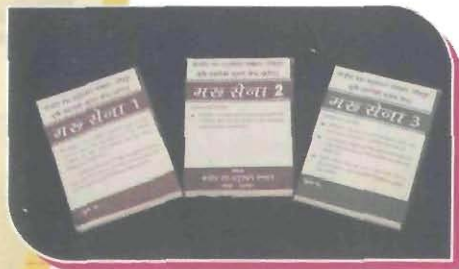


Biophos: Prepared from the cultures of *Chaetomium globosum*. Mobilizes plant unavailable inorganic and organic phosphorus from soils. The phosphorus response on crops after seed inoculation is equivalent to fertilizer application of 45-60 kg single super phosphate per hectare. BC ratio 15.

Neem Pellets: Prepared from depulped whole neem seeds and eucalyptus oil. Protect the *Kharif* legumes from soil borne pests especially termites, rodents and also provide nutrients.



Kisan Sakha 1: Talc based entomo-pathogenic formulation of *Metarrhizium anisopliae* adapted to warm ambience. Effective against soil borne pests like termites, white grubs and *Khejri* root grub.



Maru Sena 1: Bioformulated from native strain of *Trichoderma harzianum*, it effectively controls important soil-borne plant pathogens like *Macrophomina phaseolina* and *Fusarium* causing dry root rot in legumes and wilt on cumin and other crops, respectively. BC ratio 24 for soil application. It can be used as seed treatment (4 g per kg seed) or as soil application (1 kg mixed in 50 kg FYM).

Maru Sena 2: Bioformulated product of *Aspergillus versicolor*. This is a heat tolerant strain (up to 65°C) under low soil moisture conditions, effective against *Fusarium oxysporum* f. sp. *cumini* causing wilt of cumin. Compatible with *Bacillus firmus* (Maru Sena 3). It can be used as seed treatment (4 g per kg seed) or as soil application (1 kg mixed in 50 kg neem compost or FYM). BC ratio 24 for soil application.

Maru Sena 3: *Bacillus firmus*, isolated from cruciferous residue amended soil is specifically effective against *Macrophomina phaseolina* causing dry root rot in legumes and oil seed crops. It also improves nodulation and plant growth of legumes. Its bioformulated product (200g) prepared in lignite as a carrier can be used to treat seeds for one acre sowing. BC ratio 28 for seed treatment.

Varieties Developed

Food crops: High yielding varieties of pearl millet (CZP 9802, CZ-IC 923), clusterbean (Maru guar), moth bean (Maru moth, CAZRI Moth-1, CAZRI Moth-2, CAZRI Moth-3) and horse gram (Maru Kulthi-1) have been developed, which can give higher yields in arid and semi-arid regions. The dual purpose pearl millet variety CZP 9802 is grown on over 25,000 ha area and getting popular in spite of competition from hybrids.

Horticultural Crops: A number of varieties have been identified that can be successfully raised even on marginal lands with certain conservation measures. These include Gola, Seb and Mundia of *Ber*, Jalore seedless of *Anar*, Dhara Road and Faizabadi local of *Bael*, Kanchan and Krishna of *Aonla*.



Grasses



Marwar Dhaman of *Cenchrus setigerus*: It is semi-erect type. Plants are 50 - 60 cm tall, leaves medium-narrow, long, yellowish green and semi-erect, nodal pigmentation is brown, flowers (50%) in 45-55 days and slow senescence. Green fodder yield is 5.85 t per ha. Very much relished by small ruminants.

Marwar Anjan of *Cenchrus ciliaris*: It is erect, 60-90 cm tall with long, broad, droopy and green leaves, actively growing and flowers (50%) in 50-60 days. It yields 2.85 t dry matter and 8.81 t green fodder per ha.

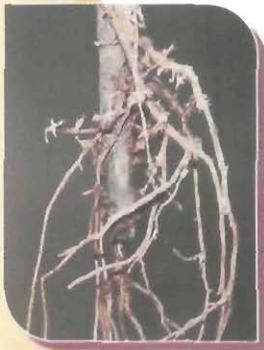


OTHER TECHNOLOGIES

Enhancement of Gum Production from *Acacia senegal* (Kumat): A gum-inducing solution (ethephon) is injected into the main stem of the tree through a small hole. Requires no further injury or cut to the plants and yields 500g gum per tree. Cost of treatment is Rs. 10 per tree. BC ratio 5.



Propagation of *Commiphora wightii* (Guggul): Major bottleneck in mass propagation of guggul is difficulty in rooting of cuttings (10-15%). A method of seasoning the cuttings before applying rooting hormone (IBA) has given almost cent per cent success in rooting, besides drastic reduction in time of sprouting.



Rodent Control: Rodenticidal baiting technology simplified. Improved the line traps as per size of rodent species. The IPM system for rodent control developed. BC ratio 10.8 in spice crops.



MACHINES / TOOLS

Solar Tracker: An automatic light sensing solar tracking device that enhances harnessing of solar energy by 25%. Besides, it tracks the solar energy gadget continuously throughout the day and returns automatically the next morning. The unit costs Rs. 5000.



Aloe vera Gel (Fillet) Extractor: A mechanical unit for extracting *Aloe vera* gel (fillet) developed, which crushes 60 - 80 kg fresh leaves per hr. The unit costs Rs. 4000.



Aonla Pricker: An *aonla* pricker has been designed and developed, which can prick about 7-8 kg *aonla* per hr against 1.5 kg per hr with a fork.



Animal Feed Block Making Machine: About 40 feed blocks per hr can be prepared with this unit. Different feed ingredients are metered individually in the pre-decided proportion and mixed to make the feed block.

PLANTS MENTIONED IN BULLETIN

Photos of plants at following serials appear on Back Cover

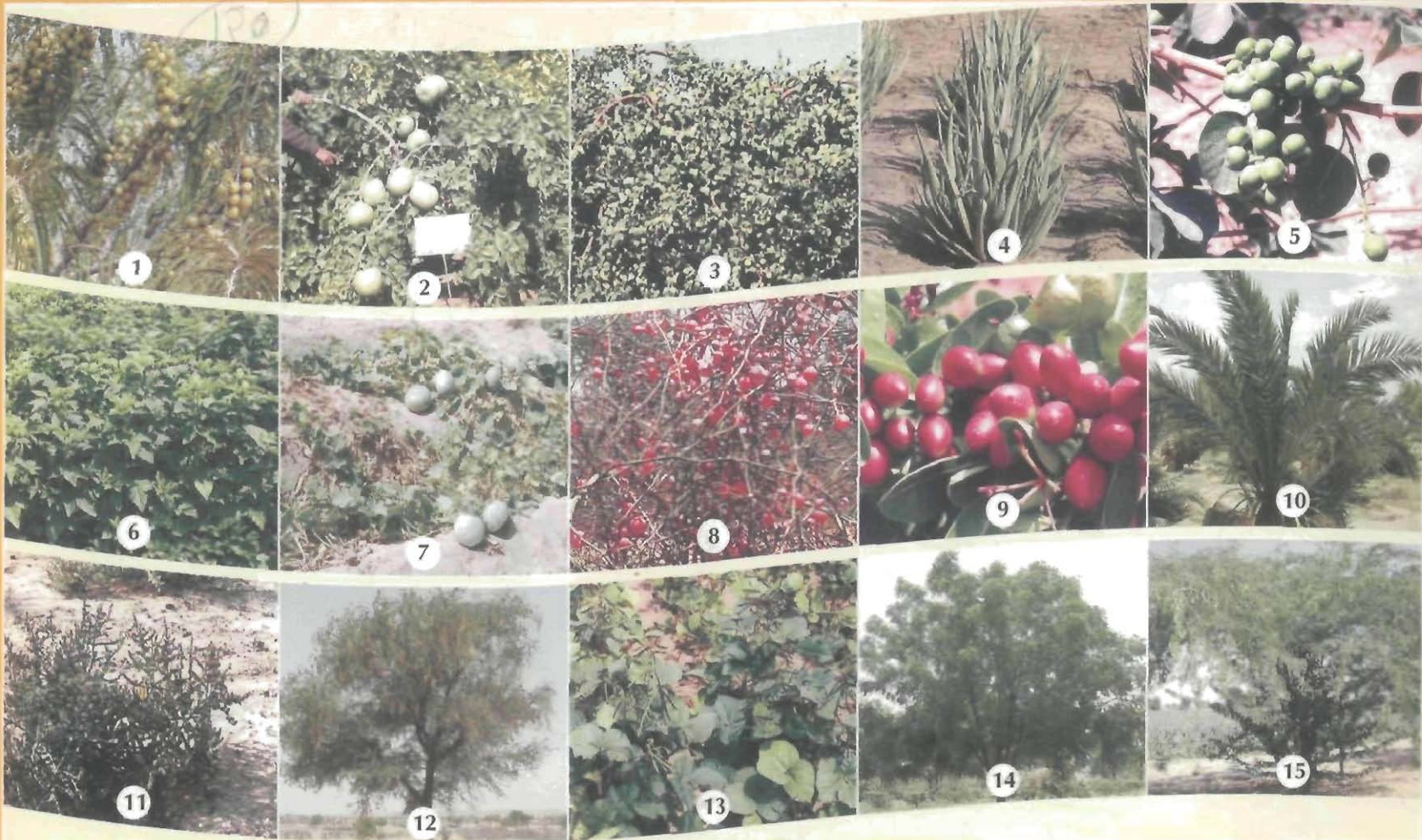
S.No.	Hindi Name	Scientific Name	English Name
1.	Aonla / Amla	<i>Emblica officinalis</i>	Indian gooseberry
2.	Beal	<i>Aegle marmelos</i>	Bael
3.	Ber	<i>Ziziphus mauritiana</i>	Jujube
4.	Gwar patha / Ghikanwar	<i>Aloe vera</i>	Barbados aloe
5.	Gonda	<i>Cordia gharaf</i>	–
6.	Guar	<i>Cymopsis tetragonoloba</i>	Cluster bean
7.	Kachri	<i>Cucumis callosus</i>	–
8.	Kair / Karer	<i>Capparis decidua</i>	Caper berry
9.	Karonda	<i>Carissa carandas</i>	Karanda
10.	Khajoor	<i>Phoenix dactylifera</i>	Date palm
11.	Khara lana	<i>Haloxylon recurvum</i>	–
12.	Khejri (Pods known as Sangri)	<i>Prosopis cineraria</i>	Indian mesquite
13.	Mung	<i>Vigna radiata</i>	Mung bean, Greengram
14.	Neem	<i>Azadirachta indica</i>	Margosa tree
15.	Vilayati babool	<i>Prosopis juliflora</i>	Mesquite

Photos of following plants appear in the text

S.No.	Hindi Name	Scientific Name	English Name
1.	Anar	<i>Punica granatum</i>	Pomegranate
2.	Bajra	<i>Pennisetum glaucum</i>	Pearl millet
3.	Kulthi	<i>Macrotyloma uniflorum</i>	Horse gram
4.	Kumat / Kumta	<i>Acacia senegal</i>	Gum arabic
5.	Moda Dhaaman	<i>Cenchrus setigerus</i>	–
6.	Moth	<i>Vigna aconitifolia</i>	Moth bean
7.	Rundar Dhaaman	<i>Cenchrus ciliaris</i>	–
8.	Tumba	<i>Citrullus colocynthis</i>	Colocynth

Photos of following plants appear on the Inner First Cover

1.	Guggul	<i>Commiphora wightii</i>	Indian bdellium
2.	Meetha Jaal (Fruits known as Peelu)	<i>Salvadora oleoides</i>	–



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