INTRODUCTION, UTILIZATION AND FUTURE POTENTIAL OF CACTUS PEAR IN INDIAN ARID ZONE

P.R. Meghwal, A.K. Patel, M. Patidar and M.M. Roy

(Indian Council of Agricultural Research)
Central Arid Zone Research Institute
Jodhpur(Rajasthan)India

INTRODUCTION

- The Indian hot arid zone covers sizeable area (31.70 m ha) spread over seven states and constitutes 11.8% of its geographical area.
- The climatic condition of arid zone is characterised by extremes of temperature, high wind velocity, sandy soil, low, uncertain and erratic annual rainfall (100-400mm), with very high frequency of drought. Wast area is also under semi arid conditions, waste land and problematic soils.
- Cacti holds great potential on account of its economy on water use due to special photosynthetic mechanism i.e. Crassulacean Acid Metabolism (CAM) and their multiple uses.
- Earlier germplasm introduction in India took place from Mexico (USA).
- Recently 43 accessions have been acquired from Tunisia in collaboration with ICARDA. The introduced germplasm is being multiplied and evaluated while animal feeding trials were conducted with thornless cacti introduced earlier.

Introduction of cactus pear germplasm from Tunisia at CAZRI, Jodhpur

S.N.	Accession No.	Variety	S.N.	Accession No.	Variety
1	EC 668321	Nudosa	12	EC 668332	Rossa macomer (M2)
2	EC 668322	Rosaa San Cono	13	EC 668333	Bianca bonarcado
3	EC 668323	Giall X Giall	14	EC 668334	Morado
4	EC 668324	Rossa San Sperate	15	EC 668335	Bianca san cono
5	EC 668325	Rossa x Rosa4 Pianta - 31	16	EC 668336	Rossa castel sardo
6	EC 668326	Rossa x Rossa4 pianta-17	17	EC 668337	Bianco macomer
7	EC 668327	Rossa x Rossa4 pianta-25	18	EC 668338	Gialla sarroch
8	EC 668328	Rossa Valledoria	19	EC 668339	A. giant
9	EC 668329	Gialla Macomer (MI)	20	EC 668340	Gymonocarpe
10	EC 668330	Gialla Sancona	21	EC 668341	Rossa x bianco
11	EC 668331	Bianca san sperate	22	IQ-27/10	White Sen Cono

Germplasm contd..

S.N.	Accession No.	Variety	S.N.	Accession No.	Variety
23	IQ-26/10	Whiterose a palvha	35	-	Cristallina(thorny)
24	IQ-26/10	Rosalisa	36	IQ-27/10	Red Roseapolyma
25	IQ-26/21	Trvnzara red san cono	37	IQ-26/10	Yellow poeapalumba
26	-	Lyria(thorny)	38	-	Seedless Santamargreta balice
27	IQ- 26/10	Seedless Poccaplumba	39	-	Israelihonstra
28	IQ-26/10	Horaddo	40	IQ-26/10	Blue hoto
29	IQ-26/10	ARL Spineless	41	IQ-27/10	Zastrony
30	IQ-26/10	Red san cono	42	IQ-26/10	AllerianA
31	-	Hillitello White	43	IQ-26/10	Plypoly
32	IQ-27/10	Fafyco			
33	IQ-27/10	Yellow			
34	-	Reyna(thorny)			

Survival/sprouting in exotic cactus pear accessions after 120 days of planting

S. No.	Accession No.	No. of cladodes planted	Survival/sprouting (%)
1	EC 668321	7	0.00
2	EC 668322	9	33.33
3	EC 668323	10	30.00
4	EC 668324	8	12.5
5	EC 668325	9	22.22
6	EC 668326	8	25.00
7	EC 668327	8	25.00
8	EC 668328	6	66.00
9	EC 668329	7	42.85
10	EC 668330	10	50.00
11	EC 668331	7	14.28
12	EC 668332	6	66.66
13	EC 668333	9	11.11
14	EC 668334	10	20.00
15	EC 668335	10	30.00
16	EC 668336	9	33.00
17	EC 668337	9	33.00
18	EC 668338	10	10.00
19	EC 668339	10	80.00

Survival/sprouting in exotic cactus pear accessions after 120 days of planting

S.No	Accessions/cultivars	No. of cladodes planted	Survival/sprouting (%)
1	IQ-27/10 white sen cono	4	50.00
2	IQ-26/10 whiterose a palvha	4	0.00
3	Rosalisa	4	75.00
4	IQ-26/21 trvnzara red san cono	3	66.66
5	Lyria(thorny)	5	20.00
6	IQ- 26/Seedless Poccaplumba	3	0
7	IQ-26/10 Horaddo	3	33.33
8	IQ-26/10ARL Spineless	3	66.66
9	IQ-26/10 Red san cono	4	25.00
10	Hillitello White	4	75.00
11	IQ-27/10Fafyco	3	0
12	IQ-27/10Yellow	3	0
13	Reyna(thorny)	3	0
14	Cristallina(thorny)	3	66.66
15	IQ-27/10 Red Roseapolyma	2	0
16	IQ-26/10 Yellowpoeapalumba	5	20.00
17	Seedless Santamargreta balice	3	33.33
18	Israelihonstra	3	0
19	IQ-26/10Blue hoto	3	0
20	IQ-27/10zastrony	3	33.33
21	IQ-26/10 Allerian	3	33.33
22	IQ-26/10 Plypoly	3	0

Growth of exotic cacti germplasm accessions after six month of planting

Accession No.	Plant height(cm)	No. of cladodes	Cladode size Length x breadth(cm)
EC 668322	33.3	3	15x8
EC 668323	29.0	3	18x9
EC 668327	32.0	3	15x7
EC 668336	33.3	3	21x10
EC 668337	32.0	4	18x8
EC 668339	47.0	3	24x15
EC 668340	33.0	4	22x8
EC 668341	21.0	2	16x8
Rosalisa	30.5	3.5	19.5x8.5
IQ-26/21	24	1	13x6
Lyria(thorny)	17	2	14x6
IQ-26/10ARL Spineless	6	1	9x5
IQ-26/10 Red san cono	26.5	5	17x8
Hillitello White	36.5	1.5	26x15
Cristallina(Thorny)	33.0	4	20x14
IQ-26/10 Yellowpoeapalumba	32.0	2	21x13
Seedless Santamargreta balice	26.0	3	15x6
IQ-26/10Blue hoto	52.5	2	24x10
IQ-26/10 Allerian	28.0	2.5	19x8

UTILIZATION

As vegetable(Nopalito)....

- The freshly harvested Immature cladodes can be used as vegetables after removing the spines, young leaves, and edges and cutting them into strips or small cubes.
- This vegetable can be used in many forms- salads and cooked dishes with meat.
- In India this is yet to become popular due to non availability of suitable cultivars even though there is great potential.

As fruits(Tuna).....

- The greatest potential of cactus pear as horticultural crop has been realized in its attractive and unique fruits.
- *Opuntia ficus-indica* is the most important species for fruit production in India as it is exploited worldwide
- The thick spiny peel needs to be removed before reaching the tasty flesh.

As animal feed....

- Cactus is ideal feed for livestock in arid and a semi arid region where drought is common and animal feed is scarce.
- Animal feeding trials at Central arid Zone Research Institute have shown good acceptability and palatability of chaffed thornless cactus pear pads both by small ruminants and cattle.
- The intake of chaffed cactus cladodes per animal increased from 3.07± 0.41 kg in the first week to 5.0±1.87 kg in the fifth week with accompanied increase in water intake and body weight gain in the test animals
- The total dry matter intake (DMI) in growing kids and lambs fed on 1:1chopped Opuntia pads and lentil straw was almost similar but kids had higher intake of fresh *Opuntia* pads while the lambs had higher intake of lentil straw
- The trials conducted on 10 months old goats with thin fronds of *Opuntia ficus-indica* mixed with lentil straw@ 33 % and 50 % indicated that the goats fed on opuntia fronds mixed straw @ 33% gained body weight(2.67 kg) whereas those fed on similar straw with 50% opuntia fronds lost body weight@1.2 kg.

Effect of feeding Cacti on body weight and water intake in Tharparkar bull calves

Parameter	First week		Fifth week	
	Control group	Treatment group	Control group	Treatment group
Palatability of cactus (kg)	-	3.07± 0.415	-	5.05± 0.83
Water intake (L/day)	10.10± 1.87	12.5± 0.28	13.88± 1.54	15.18± 0.03
Body weight (kg)	180.25 ±5.14	182.25 ± 19.36	175.25±10.89	188.5± 20.89

Dry matter and water intake in goats fed on mixed rations with thin fronds *Opuntia*

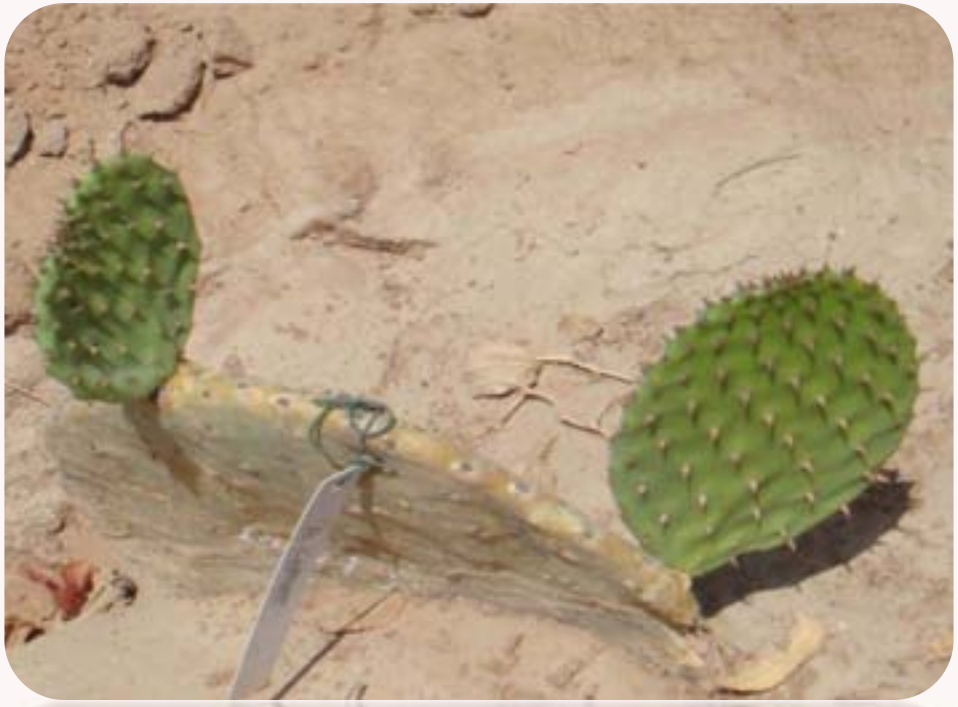
S.N.	Parameter	Gr I(33%)	Gr II(50%)
1.	Body Weight(Kg)		
	i) Initial	28.80	23.85
	ii) Final	29.40	22.65
	Total BW gain/loss	0.60	-1.20
2.	Feed Intake (g/day)		
	a) Lentil straw	749.54	498.57
	b) *Opuntia*	742.80	889.64
3.	Total DM Intake	822.68	554.18
	a) %BW	2.84	2.38
	b) g/Kg $W^{0.75}$	65.82	52.34
4.	Water Intake (l)	2.33	1.93
	Wl/kg DMI	2.83	3.48
	Total Wl (Feed+Wl)	3.05	2.76

Comparative DM and water intake in goats and sheep fed on mixed diets with thick fronds *Opuntia* and Lentil straw

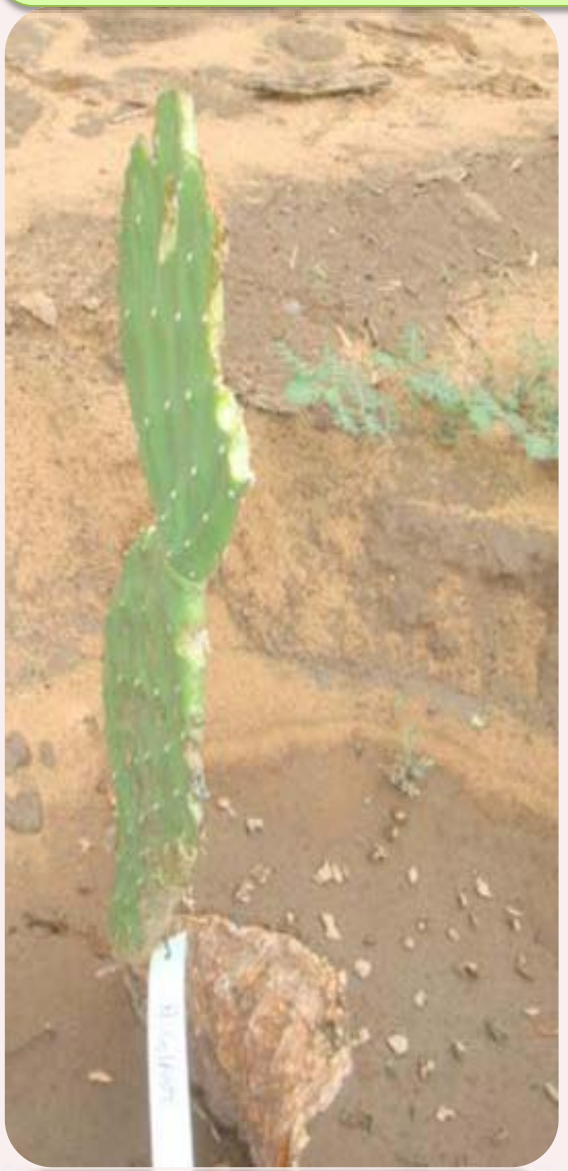
S.N.	Parameter	kids	Lambs
1.	Body Weight (Kg)		
	i) Initial	24.05	24.85
	ii) Final	23.06	24.84
	Total BW gain/loss	-1.01	-0.01
2.	Feed Intake (g)		
	a) Lentil straw	665.50	681.00
	b) *Opuntia*	900.50	732.75
3.	Total DM Intake	751.9	746.9
	a) %BW	3.19	3.01
	b) g/Kg $W^{0.75}$	70.3	67.1
4.	Water Intake (l/h/d)	1.48	1.83
	Wl/kg DMI	1.97	2.45
	Total Wl (Feed+Wl)	2.29	2.50

Animal feeding trials with cactus pads

Multiplication of germplasm introduced from Tunisia



Damage to tender cladodes by birds during multiplication



Flowering and Fruiting in clone No.1270

FUTURE POTENTIAL

- Cacti may prove a boon for the rehabilitation of degraded sites including wastelands, rangeland and, local pastures etc.
- The low cost of cactus production and its tolerance to drought, make it imminently suited for becoming a viable future industry in India.
- The Thar desert in Rajasthan, Rann of Kutch in Gujarat, south-western parts of Haryana, Bundelkhand, and other similar rain fed areas prone to severe drought would be potential areas for cacti cultivation.
- Some area of semi arid region may also be put under cactus cultivation for specific uses.
- There is also great potential of exploiting different species of cacti for medicinal, pharmaceutical and cosmetic industries in a big way.