



केन्द्रीय शुष्क क्षेत्र अनुसंधान संस्थान
CENTRAL ARID ZONE RESEARCH INSTITUTE
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Central Arid Zone Research Institute

CAZRI NEWS

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From the Director...



Food security and provisioning of livelihood are very important in dry areas, as these are home to over 2 billion people and the majority of it have very low income (\$ 1-2/day). Most of the income is spent on food and food security is under threat. The environmental poverty - water scarcity, poor water quality and land degradation - is a real potential threat to food security and health.

Despite these challenges, there is a possibility of creating alternate pathways to take out this population out of the poverty trap. The constraints of dry areas like abundant sunshine, warm temperature and a long growing season may be converted into opportunities through adequate investments in research and enabling policies for the farmers to adopt appropriate production and resource management practices.

Now it has become absolutely essential to have an integrated approach for sustainable agriculture, crop and livestock improvement and natural resource management. Also, there has to be continuous flow of new technologies to arid farming communities in the present climate change scenario.

Another important area is the identification of constraints for the adoption of currently available proven technologies and proper policies, and incentives are required for encouraging wider adoption.



-M.M. Roy

RESEARCH ACTIVITIES

Improving Crop Yield from Sodic Water-Irrigated Soil- A Success Story

Use of groundwater having high residual sodium carbonate (RSC) for irrigation, leads to gradual degradation of soil quality and low crop yield. CAZRI has refined the technology of amelioration and management of soils irrigated with sodic water for arid regions. In order to popularize the technology, it was demonstrated in two fields in Budiwara village in Barmer district and Dhundhara village in Jodhpur district, during rabi season of 2008-09 and 2009-10. The soil pH at the experimental sites was 8.8-9.7 and electrical conductivity was 0.208-0.875 dS m⁻¹. Gypsum requirement (GR) of the soils varied from 4300 kg to 10700 kg ha⁻¹. The RSC of the irrigation water varied from 2.4 to 22.7 meL⁻¹. Based on the initial data of soil and water, treatments were three levels of gypsum i.e. 25, 50 and 100% of gypsum requirement of the soils, along with a control plot (without gypsum). Wheat (Raj 3077) was grown following standard agronomic management practices with seven irrigations. Plant height, plants m⁻², number of effective tillers per plant, spike length and leaves per plant were higher when gypsum was applied @ 50% of GR of the soil in comparison to control and gypsum application @ 25% of GR. Grain and straw yield of wheat increased by 20-35% over control and the grain yield was the highest (4800 kg



Fig. 1. Wheat crop irrigated with sodic water (control)



Fig. 2. Wheat crop grown with 50% of gypsum requirement

ha⁻¹) at Dhundhara village followed by 4400 kg ha⁻¹ at Budiwara. The benefit/cost ratio was also higher in case of 50% of GR (2.45 and 2.37). With gypsum application @ 100% of GR the B:C ratio was 1.97 in the field at Dhundhara and 2.18 at Budiwara. Thus, gypsum application @ 50% of GR was found to be the best treatment at both the sites (Figs. 1 and 2). The technology generated huge interest among the farmers from distant villages.

-Mahesh Kumar

Perennial Forage Legumes for Quality Fodder Production in Arid Areas of Gujarat

Three perennial forage legumes viz., clitoria, stylo and wild groundnut were evaluated for yield potential in the region. The dry fodder yield ranged from 1595 to 3500 kg ha⁻¹. The wild groundnut (*Arachis glabrata* and *A. prostrata*) performed well in the region and survival was more than 87%, while *Stylosanthes hamata* yielded 3500 kg ha⁻¹ dry fodder. In case of clitoria, IGFRI 173-1, CAZRI 752 and JHC 94 yielded more than 3000 kg ha⁻¹.

In another field experiment, response of clitoria to bio-fertilizers viz., rhizobium, phosphorus solubilising microbes (PSM) and plant growth promoting rhizobacteria (PGPR) applied as seed treatment was assessed. PSM increased the dry fodder yield by 34.3%, closely followed by PGPR (32.2%) and rhizobium (15.8%) over the control. The maximum dry fodder yield of 3349 kg ha⁻¹ was obtained in case of N and P at 50% of RDF along with application of rhizobium and PSM. The lowest yield of 1193 kg ha⁻¹ was recorded in control.



Evaluation of wild groundnut as forage legume

-Devi Dayal

Witches Broom Disease Reduces Quantity and Quality of Seeds in *Salvadora oleoides*

Salvadora oleoides, locally known as Piloo and Jal (Fig. 1) is ecologically adapted for salt affected, alkaline/saline and rocky/sandy soils in arid and semi-arid regions. The seed has 45-50% non-edible oil used for making soaps and other commercial/industrial products. Recently, Witches broom disease (WBD) has been found to be a serious disease of *Salvadora oleoides* (Fig. 2) causing heavy loss of seeds. The major symptoms of the disease are floral virescence, phyllody and proliferation. Such inflorescences produce dense mass of shoots from the diseased floral apices, resulting a structure resembling broom or a bird's nest. Other symptoms which sometimes accompany the disease are yellowing, small sized and abnormal seeds and seedlings. Light microscopy of hand-cut sections of disease affected stem or leaf tissues treated with Dienes' stain showed blue areas in the phloem region of phyllody infected plants. Phytoplasma was found in the sieve cells of infected stems. Various insects including leafhopper were found associated with infected tissues which may help in transmission of phytoplasma pathogen from one tree to another. Maximum number of disease-affected trees was observed in Norwa,

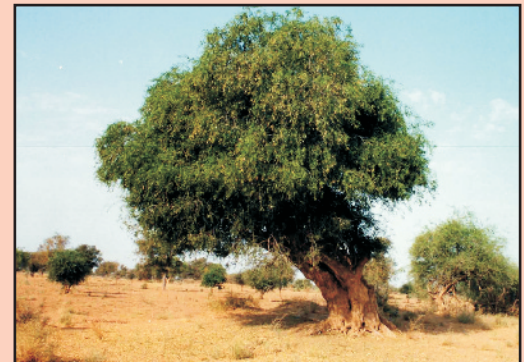


Fig. 1. *Salvadora oleoides* tree in saline soils with full bearing of fruits

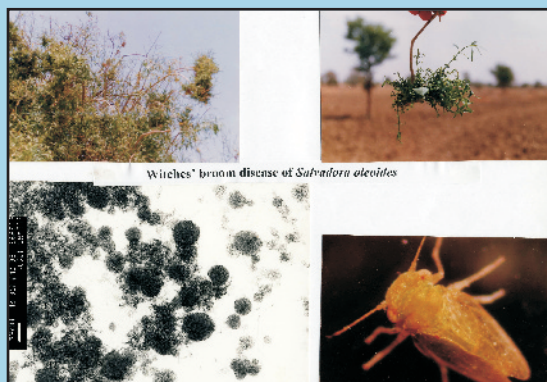


Fig. 2. WBD of *S. oleoides*-symptoms, pathogen and insect vector



Fig. 3. Fruits collected from different germplasm of *S. oleoides* having variation of WBD resistance

Narwana and Bisalgarh in Jalor district. Incidence of gall and the disease was more pronounced in Jalor district compared to Barmer and Jodhpur. Severe disease incidence occurred in Barmer (84%) followed by Jalor (81%) and Jodhpur (78%). Outbreak of the disease was more severe during good monsoon years. Severity of disease varied from moderate to susceptible. However, large variability among the trees exists in relation to germplasm and severity of disease. Trees having pink to violet colour fruit are more susceptible than yellow or greenish yellow fruit bearing trees (Fig. 3). Diseased inflorescences produced few seeds, which were abnormal in shape, size, weight and colour. Seed vigour and seedling length were lower (31%) in comparison to healthy seeds. In most of the cases reproductive meristems transform into abnormal bushy vegetative leafy growth, which reduces the quantity and quality of the seeds.

-R.R. Bhansali and S.K. Jindal

Nano-particles Enhances Synthesis of Fungal Polysaccharides and Phosphatases

Effect of nano ZnO (spherical, 16 nm average size) on production of polysaccharides, phosphatases and phytase was studied on two fungi (*Chaetomium globosum* and *Curvularia lunata*). The fungi were tested for the yield of polysaccharides as well as phosphatases (acid and alkaline) and phytase in presence of similar concentration of ZnO compound. The results showed 8 to 9-fold improvement in extra cellular polysaccharide secretion due to application of nano ZnO. The intracellular polysaccharide content also improved by 5 to 8-fold. Nano ZnO application also enhanced acid phosphatase (51 to 108%) and alkaline phosphatase (80 to 209%) activity. The phytase activity improved between 137 and 174%. In general, significant effect of nanoparticles was observed in production of acid phosphatase (4.9 to 14.3%), alkaline phosphatase (14.6 to 22.1%), phytase (25.0 to 144.7%), extracellular polysaccharides (104.7 to 837.3%) and intracellular polysaccharides (246.2 to 374.3%) as compared to similar concentration of mega particles. The results suggest that nano ZnO is very effective in synthesis of fungal polysaccharides and phosphatases than ZnO compound of similar concentration.

-J.C. Tarafdar

Summer Crop of Moth Bean

Moth bean is normally cultivated as rainfed during the monsoon or kharif season. The feasibility of growing it during summer with limited irrigation was tested at the Institute research farm keeping in view its low water requirement and high heat tolerance ability. Two short duration varieties developed by the Institute, CAZRI Moth-2 and CAZRI Moth-3 were grown providing up to three post-sowing irrigations at an interval of 15-20 days. Sowing was done in rows with spacing of 40 cm using 10 kg seed ha⁻¹. No fertilizer or plant protection chemicals were used.

Crop/variety	No. of irrigations	Grain yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)
Moth bean cv.	2	347	1041
CAZRI Moth-2	3	520	1909
Moth bean cv.	2	225	954
CAZRI Moth-3	3	520	1354
Mung bean cv. SML-668	3	468	-

The summer crop of moth bean matured in 60 days of sowing in second week of May and produced about 11% higher yield over mung bean. This indicated that good crop of moth bean could be raised with limited water during the summer season.

- A. Henry and P.K. Roy

OTHER ACTIVITIES

Visitors

- Mr. Michael Williams and Mr. Steven Duke, Editor, BBC World Service, London, UK, July 8, 2010
- Delegation from ICRAF, Kenya & Univ. of Nairobi, July 19, 2010
- Shri Asit Tripathi, Additional Secretary, Ministry of Commerce, GOI and Chairman, APEDA, August 19, 2010
- Dr. A.K. Singh, DDG (NRM), September 20, 2010
- Mr. Harin, V., IFS (P), IGNEFA, Dehradun, September 29, 2010
- Dr. T.S. Rathore, Director, AFRI, Jodhpur, September 29, 2010
- Mr. R. Senthil Kumaran, IFS (P) with group (batch 2009-2011), September 30, 2010

Celebrations

Hindi Week from September 14-21, 2010.

Kisan Mela on September 29, 2010.

Trainings / Demonstrations

KVK, Jodhpur

- 75 Trainings on different courses to 1725 participants
- 205 Front Line Demonstrations on pearl millet, mung bean and clusterbean

RRS, Kukma-Bhuj

- Training on budding in ber to 50 farmers from 5 villages
- Demonstrations of improved production technologies in Dhaneti, Gander, Kotda, Tharawara and Khanbhra villages of district Bhuj under Farmers Participatory Action Research Programme (FPARP)
- Demonstrations of cultivation of improved cultivars of clusterbean, sesame, castor and green gram along with integrated nutrient management in 10 farmers' field in kharif 2010
- Demonstration of improved cultivars of ber (Gola and Seb) in 10 farmers' field. Looking into the success of improved variety of ber, many farmers from nearby villages planted ber orchard for profitable production.

Field Days

- Dhaman Grass at village Badaliya, Tehsil Luni, September 6, 2010
- Kharif Crops at village Agolai, Tehsil Balasar, September 8, 2010
- Pulses Technology at village Birami, Tehsil Luni, September 15, 2010
- Animal Health Camp at village adopted under KVK

Organization of Workshop

NAIP Workshop on Nano-technology at IIT, Mumbai from August 12-13, 2010

Fellowship/Award

- Mr. Shamsudheen, Scientist (Soil Science) received ICAR International Fellowship for Ph. D. at University of Reading, UK
- Dr. Devi Dayal, received "PSI Certificate of Excellence-2010" in the field of Agronomy by Academy of Plant Sciences, Muzaffaranagar, UP

Seminar/Symposia

Dr. Devi Dayal, Head attended XIX APSI Meet and presented Key-Note Address on Efficient Water Management for Higher Crop-Water Productivity in Arid Region-Present Status and Future Research Need, at Hyderabad from September 30-October 01, 2010.

PERSONNEL

Appointments: Dr. R.K. Bhatt, Head, Division of Plant Improvement, Propagation and Pest Management, August 23, 2010; Sh. Hari Mohan Meena, Scientist (Agrometeorology), August 28, 2010; Dr. Soma Srivastava, Scientist (Food & Nutrition), September 9, 2010

Promotions: Sh. Mohar Singh, T-6 (TO) promoted to T-7-8 w.e.f. January 1, 2008; Sh. Ramesh Kumar Panwar, Assistant promoted as Asstt. Adm. Officer at Regional Research Station, Pali, July 1, 2010; Sh. Narsing Ram, Stenographer promoted to Private Secretary, September 17, 2010; Smt. Marriamma Mathews, Stenographer promoted to Private Secretary, September 17, 2010.

Transfers: Dr. Arvind Kumar, Scientist (Genetics/Cytogenetics), transferred from Jodhpur to RRS, Kukma, Bhuj, July 05, 2010; Dr. Bhagirath Ram, Scientist (Genetics) transferred from RRS, Kukma, Bhuj to Jodhpur, July 09, 2010; Sh. Sanjay Bakolia, Chief Administrative Officer from IVRI, Izatnagar, September 9, 2010; Sh. Sushant Saha, Senior Administrative Officer to NRCC, Nagpur, September 14, 2010.

Superannuation: July 2010- Dr. D. Kumar, Principal Scientist (Plant Breeding); Sh. Bhanwar Lal Balai (T-5: Driver); Sh. Bhanwar Singh (RM); Sh. Mod Singh (RM); Smt Sayar w/o Jeev Raj (RM).

August 2010- Dr. L.N. Harsh, Principal Scientist (Forestry); Sh. V.C. Issac, T-9 (TO); Sh. M.D. Sharma, T-5 (TO); Smt. Annamma Varghese (Private Secretary); Sh. Abdul Saleem Khan (SSG); Sh. Bhaku (RM); Smt. Chuki (RM); Smt. Sakiya (RM).

Training/Meetings Attended: Dr. Uday Burman, meeting on "Knowledge Management" at IIM (Khozikode, Kerala), August 16-18, 2010; Sh. A. Henry, meeting on Development of high yielding varieties of pulses and increasing the seed production in Rajasthan state' convened by the Government of Rajasthan, Jaipur, August 26, 2010; Dr. Suresh Kumar and Dr. Anurag Saxena, Training on "Climate Change and Carbon Mitigation" at ICFRE, Dehradun, September 6-10, 2010; Sh. A. Henry, meeting on "Guar Gum Production" convened by the Indian Guar Gum Manufacturers Association, Jodhpur, September 18, 2010; Dr. P.K. Roy, Regional Workshop-cum-Training on "Establishment of National Information Sharing Mechanism on the Implementation and Monitoring of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture" held by National Bureau of Plant Genetic Resources, at New Delhi, August 30, 2010.

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