Vol. 11 No. 3 July-September, 2005

To our readers

This year the rainfall has been erratic affecting the kharif crops at Jhansi, while in the other parts of the country, there has been flood and untimely heavy rain affecting crops and human habitations. In the past five years, the behaviour of rain has been erratic. Such situation affects productivity of grasslands and forage crops. While the perennials are able to cope, annuals get affected due to delayed sowing and moisture deficit at the critical time. Such a situation also calls for proper disease management. We have been emphasizing the perennials integration only due to this.

During the period, Group Meeting of the AICRP on Forage Crops was organized and the rabi programme was reviewed at Bikaner. It was emphasized that serious efforts were required to enrich the germplasm collections and generate genetic variability to help identification of good varieties. Two varieties of Oats from IGFRI were identified for release. The Institute has also identified a variety of Anjan grass (Bundel Anjan - 3) during the National Group Meeting of Forage Crops.

Berseem cultivation during the winters in northern India is very common. The initiatives taken by the Institute during the last 25 years have been reassessed in two villages. It shows that it has helped in promoting milk production, besides the direct sale of fodder in the market. Constraints have also been identified to undertake research in future.

At the institute, we initiated research on use of Fly-ash for improving forage productivity. The results of kharif and rabi crops show encouraging results on the red and black soils. It has also been found environmentally safe and desirable for the poor soils to improve their physical characteristics helping in ideal moisture availability to the crops.

We also organized kisan mela at Avikanagar, which received very good response from the farmers. Proper techniques of fodder production were demonstrated to augment forage productivity in the region.

Appropriate crop varieties, management techniques and amendments are needed to meet the demand of assured forage production even in the years of erratic monsoon so that the livestock do not suffer from the malnutrition. We have tried through our multifaculty and interdisciplinary research projects of basic, applied and strategic nature to achieve it. The visibility of our research has improved in the past years through quality papers and the participation of our scientists in seminars and symposia. Let us commit ourselves to earn research on critical issues for a better future.

(P.S. Pathak)
Director
The National Group Meeting of the All India Coordinated Research Project on Forage Crops (AICRP-FC) for rabi 2005-06 was held at Rajasthan Agricultural University, Bikaner from 12-14 September, 2005 to review the progress of research work of the AICRP (FC) trials conducted during rabi 2004-05 and to formulate the technical programme for rabi 2005-06. In this meeting, in addition to the ICAR authorities, about 90 Scientists/ Professors from different SAUs, ICAR institutions, State departments, NDDB and private organizations participated.

In his inaugural speech, Prof. Parmatma Singh, Vice Chancellor, RAU, Bikaner (Rajasthan) gave an overview on status of forage availability, livestock population, milk production scenario and forage research in India in general and for the state of Rajasthan in particular. He advocated for greater emphasis on poor farmers oriented fodder production and conservation research and on transfer of well suited technology to the farmers.

Dr. S.N. Shukla, ADG (F&FC), ICAR & Chairman of the function enlightened the participants about the new challenges related to genetic resource upgradation and the development of varietal and production technologies. He also focused on gaps in forage research and the expectations of ICAR from forage group.

Dr. P.S. Pathak, Director, IGFRI and Project Coordinator (Forage Crops) presented highlights of research during rabi 2004-05 and outcome of the Breeder seed production programme.

The technical sessions i.e., review of research activities; formulation of technical programme (Forage crops breeding, crop protection and agronomy & soil); discipline- wise presentation; breeder seed production; special session on “Prospects of forage crops improvement in arid and semi-arid regions of Rajasthan” were organized.

The Varietal Identification Committee Meeting was held under chairmanship of Dr. S.N. Shukla, ADG (F&FC) on September 13, 2005. Three varietal proposals viz., JHO-99-1 (from IGFRI, Jhansi) of oats, RO-19 (from MPKV, Rahuri) of oats and BL-180 (from PAU, Ludhiana) of berseem were submitted for identification. The Committee discussed each of the proposals in depth and finally all the three varieties were identified for release.

Dr. S.N. Shukla, Chairman, Plenary Session suggested for generating the genetic variability for varietal improvement especially in berseem, lucerne and oats (multi cut). During the session, four research bulletins published by Dr. N.S. Yadav, Dr. S.S. Shekhawat and Dr. N.K. Sharma, Forage Scientists of RAU, Bikaner, were released.

At the end, Dr. P.S. Pathak, Director, IGFRI & PC (FC) was felicitated for his valuable contribution in the field of forage research, whose superannuation is due on Jan. 31, 2006.

Dr. D.N. Singh, PI, Plant Breeding extended vote of thanks to authorities of ICAR, New Delhi and RAU, Bikaner for their support and encouragement.

**Bundel Anjan-3 (IGFRI-727)-A promising variety of Anjan grass**

Anjan grass (*Cenchrus ciliaris*) is a highly nutritious, considered excellent pasture in dry areas and known for its forage production and intermittent grazing during drought periods in the tropics. IGFRI-727, a promising selection from exotic collections, was evaluated for four years (2001-2004) at different locations under All India Coordinated Research Project on Forage Crops. The variety was found superior among all the entries as well as checks. The variety outyielded others by a margin of 8.4 - 10.3% in green forage and 10.6 - 26.6% in dry forage production over the check in different years and locations. This has comparable crude protein percentage of 6.3 as compared to check i.e., IGFRI-3108 (6.0%) and CAZRI-75 (6.6%). It has profuse tillering capacity and quick regeneration ability. Based on the performance, this variety was recommended during May, 2005 for the arid and semi arid tracts.

*(U.S. Mishra, L.K. Karnani, N.K. Shah and P. Saxena)*
The variety Bundel Jai 2001-3 (JHO 2001-3) was identified for release and notification for cultivation in rabi season as a single cut crop in tropical and sub tropical areas of northwest and south zones comprising states of Uttaranchal, Haryana, Rajasthan, Punjab, Andhra Pradesh, Karnataka and Tamil Nadu. The variety is resistant to lodging and to the major diseases and pests. It showed significant superiority in green forage yield, dry matter yield and per day production potential over the checks in 3 years of multilocation trials. It has average yield about 50 t/ha in GFY, 10 t/ha DMY and 1.5 t/ha seed yield in normal condition. It has good level of crude protein content, high IVDMD (>60%) and high leaf/stem ratio. The variety was developed by three way intervarietal hybridization [UPO 94 × IGO 320] × Akiyutaka] followed by pedigree method of selection. The variety matures in 150-155 days. The seed is creamish yellow, long and plump having 1000 seed weight of 45 g.

(R.N. Chaubey, A.K. Roy and S.N. Zadoo)

Bundel Jai 991 (JHO 99-1) was identified for notification and release for northern hilly tracts of India. The variety has shown significant superiority over checks for GFY (>13%), DMY (>6%), better crude protein yield, seed yield (>30%) and per day productivity (>8%) over the checks in 4 years of multilocation trials. The variety was developed by intervarietal hybridization (OS 7 × IGO 320 -1139-19) followed by pedigree method of selection. It matures in 150-155 days. The average green fodder and dry matter yield in hill zone were 30 t/ha and 6.5 t/ha, respectively. The seed yield is 1.2 t/ha and seeds are creamish white, narrow, long and 1000 seed weight is 35 g. The variety possesses good fodder quality having crude protein content (9.7%), and good digestibility (IVDMD 57%). The variety is resistant to leaf blight, grasshopper, aphids and nematodes.

(R.N. Chaubey, A.K. Roy and S.N. Zadoo)

Tharparkar cattle for forage evaluation

The origin of Tharparkar, an Indian cattle breed added in IGFRI herd, was Sind province of Pakistan but their breeding tract also lies at the border district of Rajasthan. The milk yield ranges from 1800 to 2600 litre per lactation. The age at first calving ranges from 38 to 42 months and inter-calving period from 430 to 460 days. Considering its yield potentialities IGFRI is adopting this breed of cattle for the evaluation of grassland and other forages. Already 29 pedigreed Tharparkar heifers and bulls have been procured from the Cattle Breeding Farm, Suratgarh and Jaisalmer. These animals are performing well under grazing conditions. During July-August, 2005 their growth rate was 422.45 and 551.83 g/d for female and male Tharparkar heifer, respectively after extensive grazing for 8 hours a day.

(S.B. Maity)
Berseem Cultivation from one to all
(A success story)

About the village
Pahari village is situated on Jhansi-Kanpur national highway No 75, 25 km from Jhansi towards Kanpur. The village with population of 2306 comprising of 1173 males and 1133 females has total area of 806.14 ha. Area under agriculture is 733.442 ha and the total land under cultivation is irrigated. Main kharif crops are jowar, urd, moong, til, groundnut and soybean. In rabi these are wheat, oat, blackgram, pea, lentil and berseem.

Crop introduction
Berseem or Egyptian clover (Trifolium alexandrinum) is an important winter season fodder crop of the central, north, north-west and north eastern parts of India. Countrywide, the crop has wide adaptability among farmers due to its merits over any other forage crop in the winter season. The crop gives 6 to 7 cuts from November to May and the yield ranges from 100 to 120 tonnes of green fodder per hectare. Its crude protein content (up to 20%) coupled with the high digestibility of the crop (up to 70%) results in a significant increase in the milk yield.

The standard cultural practices recommended for berseem crop are, sowing to be done in mid of October in puddled soil by broadcasting at the seed rate of 25 kg/ha. The seeds should be broadcasted carefully so as to maintain uniform plant density. Care should be taken for proper sowing time as late sowing often hampers the fodder yield because of onset of severe and harsh winter which interferes with the crop growth in early stages. The phosphatic fertilizer P.O. @ 80 kg/ha should be added to the soil. If the crop is new to the field, Rhizobium culture should be mixed with seed. The crop can be first harvested at 45 days after sowing and subsequent cuts can be taken after every 30 days. Irrigation should be given to the crop as per requirement depending on soil and climatic conditions which is usually one irrigation just after harvest and other after 15 days. During 5th and 6th cut the number of irrigations need to be increased because of high temperature. The cutting schedule can also be adjusted in such a way so as to harvest green fodder everyday as per requirement.

Crop introduction in village
IGFRI scientists interacted with number of villagers to know how they got berseem introduced in their cropping system. Most of the villagers accepted that some 20 years back scientists from IGFRI told them about berseem and its importance. Very quickly few big farmers like, Mr. Pateria started growing berseem. It took commercial shape and berseem produced in the village was taken to Jhansi city for sale as green fodder. It was sold in bulk. The cultivation has paid them substantial dividend. Mr. Pateria and others accept that berseem cultivation has significant role in improving their social and economic status. Those days total area under berseem cultivation was about 7-8 ha has gone now many fold.

Changing scenario
Agriculture as any other commercial activity is greatly
influenced by the changing economic condition, demand for particular item, transport availability and cost of production. The scenario has changed in past 5 years. If we take Pahari as a test case, IGRFRI has by now started showing its presence at several places around the district. Berseem came into cultivation with many farmers around the urban area resulting into availability of berseem from nearby places at cheaper rates because of lesser transport cost. This scenario was well realized by the people of this village.

From one to all

In the changed market pattern the farmers switched over to selling of milk instead of berseem. This created in-village market for the crop. Hence, from few to most of the farmers started growing berseem in a small piece of land. In all about 30 to 40 quintals of green berseem is harvested every day and being consumed in the village itself.

Availability of seed

Production of berseem seed is practiced by most of the farmers. Seed production is presently as per their requirement and smaller quantities required by adjacent villages like Mianpur, etc. Seed production scene has also changed much in last few years. Earlier the seed production was limited with few farmers and in larger quantity and was being sold in the market. Because of uncertainty of irrigation in the late April and also the market for seed and lesser returns, the large scale production is not in practice now. At present, the cost of seed ranges from Rs. 40 to 70 per kg. Most of the seed produced in the village or nearby villages, unlike earlier days some big farmers use to sell it in market. Many big farmers have shifted to some other source of income and not the small farmers.

Further dissemination

Mianpur, a village 5 km from Pahari, got the technology of berseem cultivation from Pahari villagers only. The village comprises of about 150 families with a total population of about 1500. Berseem cultivation is in practice for nearly a decade. At present cultivation of berseem is on larger area in Mianpur than Pahari. The scenario remains same i.e., cultivation on smaller land holdings, but with large number of farmers. The landless farmers are purchasing the berseem crop in field itself and harvesting on daily basis as per need. The average cost of standing crop is Rs. 550 per 100 sq.m. In this village too, the farmers are selling milk in Jhansi city. Approximately 700-800 litres of milk is being sold and 200-300 litres being retained for domestic consumption.

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<td><strong>Pahari Bujurg</strong></td>
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<th><strong>Mianpur</strong></th>
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<td>Asha Ram</td>
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<td>Balram</td>
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<td>Anil Yadav</td>
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<td>Rajnish</td>
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<td>Bhara Singh</td>
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<td>Ram Sahay</td>
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<td>Ramesh Chandra Yadav</td>
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Crop constraints

During discussions with farmers following constraints of berseem cultivation emerged:

- Root rot and stem rot diseases. Root rot particularly causes heavy loses during last two cuts. The incidence was observed to cause up to 60% loses.
- Protection of crop during last cut when no green fodder is available.
- Poor first cut, which they compenstate with mixing of mustard.
- Berseem feeding causes thinning of milk.

Drought a recurring feature in Jhansi

The weekly rainfall distribution during kharif season (2001-2005) shows that the onset of monsoon during the current year (2005) was one week late and commenced in 27th week (July 2-8) with 84.4 mm rainfall. A good amount of rainfall received for another two weeks (fig.). Thereafter, consecutive three weeks (30-32) received 81% less rainfall than normal. The second peak appeared in 33rd week with 72.6 mm rainfall due to low pressure and upper air cyclonic circulation in central India. But the low pressure weakened and thus two successive weeks were deficit by 93% of rainfall. No rainfall took place after 37th week. The total rainfall during kharif season was 383.9 mm in 27 rainy days (rd) and it was 52.1 % less than normal (801 mm) and hence, the year has been characterized as disastrous drought year.

The total rainfall was 1068.7 (40 rd), 498.1 (25 rd), 1147.5 (34 rd), 405.4 (27 rd) and 383.3 (27 rd) mm during 2001, 02, 03, 04, and 05, respectively. A decreasing trend in total rainfall was noticed for the above period. It is interesting to note that during excess rainfall years (2001 and 03), a heavy amount of rainfall during early season is followed by low rainfall during later part of the season and vice versa. During recent past, the weeks coinciding with establishment and vegetative crop growth period (27-32 weeks) showed decreasing rainfall over the region. In Jhansi, during last five years, large (rainfall deficit =31-40%) to disastrous (rainfall deficit > 50%) drought years were observed for three years (2002, 04 and 05) which shows that drought is becoming a recurring feature in this region. Even in the year 2003, 27 to 36th weeks received only 71% of the total rain.

Weekly rainfall distribution during kharif at Jhansi

(Suchit K. Rai, Pradeep Behari and J.B. Singh)

Dynamics of zonate leaf spot disease in Sorghum

Zonate leaf spot, caused by the fungus Gloecercospora sorghi is a common disease on sorghum. The disease produce small, red to purple spots in the lower leaves at the rainy season and these lesions expand gradually. When they expand, they become red to purple and zonate spots of 0.5-5cm in length and 0.2-5cm in width are visible. A trial was conducted during kharif to monitor the disease incidence and severity in relation to weather parameters. Observation for zonate leaf spot disease incidence (% plant affected) and severity (% area affected) and weather were recorded. The dynamics of zonate leaf spot is presented in fig. The basic infection rate (R), representing the rate of multiplication of the sporulating part of disease symptom, started gathering momentum from 27 days and it showed an acceleration of rate upto 35 days. Further, the R value showed a negative rate between 36-47 days. After 47 days the R value again showed an increasing (+ve) trend. This decreasing and increasing trend of R was largely due to lower and higher values of rainfall and humidity during these periods. The mean relative humidity contributes positively to R (r=0.6406) for entire infection period of crop. The basic infection rate attained a maximum value of 28.05 units per day at 54 days of crop growth. The total area under disease progress curve (AUDPC) was estimated to be 548.8. A polynomial trend line was fitted (Y= 0.5487X^2 + 3.0711X + 4.1848) describing the basic infection rate of zonate leaf spot.
Fly ash- a potential resource for improving forage productivity

Fly ash is a waste product from coal based thermal power plants and is produced in huge quantities. As an estimate, the annual production of fly ash in the country has increased from 40 mt in 1994 to 112 mt in 2004-05 and is expected to reach upto 170 mt by 2012. Despite its various uses like brick and asbestos making, manufacturing of cement, road construction, land filling, etc. lot of fly ash still remains unutilized causing environmental and land use problems. However, the physico-chemical properties of fly ash provide an opportunity for its use in agriculture. Keeping this in view, a study has been initiated since 2004 at IGFRI, Jhansi to study the effect of fly ash application on soil properties and forage yield. Two types of fly ash (coarse and fine) were collected from Parichha Thermal Power Plant, Jhansi and were added @ 0, 50 and 100 t/ha in a medium black, clay loam and red, gravelly sandy clay loam soil. The cropping systems followed were sorghum + cowpea - berseem in red soil and sorghum + cowpea - oats in red soil. The results of the first year indicate that application of fly ash resulted into a decrease in bulk density, particle density and penetration resistance in both the soils. Use of fine fly ash decreased the porosity in red soil whereas coarse fly ash increased the porosity of black soil. Due to improvement in the porosity, the water retention characteristics of both the soils were improved (fig.1). The data on forage yield (fig.2 & 3) indicate that green forage yield of sorghum + cowpea improved by 11.7 to 16.0% on addition of fly ash. Similarly, with the application of fly ash, the green forage yield of berseem increased by 30 to 40%. In case of oats, the yield improvements were to the tune of 9.1 to 25.5% over control. The analysis of soil and plant samples for heavy metals and radionuclides revealed no toxic accumulation of these elements and their concentration was much below the permissible limits. Thus, these preliminary findings suggest that fly ash can safely be used to improve soil properties and forage productivity.

The Regional Research Station, IGFRI, Avikanagar organized a *Chara evam Charagah Prabandhan Mela evam Kisan Gosthi: 2005* on August 24, 2005. Shri Jeet Ram Choudhary, Member of Legislative Assembly, Rajasthan was the Chief Guest of the occasion. Dr. V.K. Singh, Director CSWRI, Avikanagar was the Guest of Honour, while Dr. P.S. Pathak, Director, IGFRI, Jhansi presided the function. In the *Mela*, ICAR Institutes CSWRI and IGFRI, Jhansi and RRS IGFRI, Avikanagar displayed their activities. More then 400 farmers and farm women participated in the *Mela*. The Guests and the farmers were shown the pasture and other fodder crops grown at the farm. Dr. R.K. Jain OIC, RRS, IGFRI welcomed the chief guest and other dignitaries including the State Govt. officials, scientists of CSWRI and farmers. The Chief Guest appreciated the activities going on at the center and asked the farmers to learn the techniques for growing the fodder crops and pastures. Dr. Pathak, in his presidential address, suggested the farmers to interact with the scientist and develop the degraded pastures in the area and maintain the productivity. A session on question-answer was also conducted, where the subject matter specialist answered the queries of the farmers. At the last Dr. R.B. Bhaskar, Sr. Scientist gave the vote of thanks to the guests and farmers.

Dr. Gautam Kalloo, DDG (CS & H), ICAR, New Delhi visiting the IVLP site (Garera,MP) on August 21, 2005. He interacted with the farmers and appreciated the IVLP interventions.

**Best Poster**

Indian Society of Forage Research awarded best poster presentation awards to; Dr. Sudesh Radotra, Bimal Misri and Inder Dev for their paper, "Enhancement of pasture biomass and its conservation through silage making in mid Himalayan hills" and to Dr. Inder Dev, Bimal Misri, Sindhu Sareen and Sudesh Radotra for their paper, "Role of farmwomen in livestock rearing activities in north-western Himalayan region" on the occasion of National Symposium on “Advances in Forage Research and Sustainable Animal Production”, held at CCS HAU, Hisar on August 29-30, 2005.

**Retirements**

- **Sh. Lalta Prasad**
  - T-I-3
  - on July 31, 2005

- **Sh. Govind Das**
  - Jr. Clerk
  - on August 31, 2005

*We wish them a Happy and Healthy life*