Dr. Mangala Rai, Secretary DARE and Director General, ICAR visits IGFRI

Dr. Mangala Rai, Director General, ICAR and Secretary DARE, GOI and Dr. Nagendra Sharma, Ex. Vice-Chancellor, SKUAST, Jammu visited IGFRI, Jhansi on July 31-August 1, 2009. Dr. K. A. Singh, Director, IGFRI and Dr. S. K. Dhyani, Director, NRCAF alongwith the staff of both the institutes accorded warm welcome to both the dignitaries. Hon'ble DG took keen interest in the ongoing research and development activities being carried out at the Institute. He appreciated the overall development made in infrastructure development in the recent past with special reference to the outstanding development of the Central Research (CR) farm. He laid the foundation stone of the ATIC building and inaugurated the staff canteen, VIP guest house, Inspiration tower, Water harvesting cum fish pond and Seed processing unit. He also inaugurated the auditorium and gifted it to the staff of the Institute. At the inaugural function on this occasion, Dr. K. A. Singh, Director IGFRI, formally welcomed the Chief Guest Dr. Mangala Rai and Guest of Honour Dr. Nagendra Sharma and presented a brief note on the developmental activities of the Institute. He assured the chief guest to achieve the laser leveling of the field in CR farm would be completed within a year to enhance the forage productivity by 30-35%. Dr. Dhyani also welcomed the guests and informed the development accomplished during the X Five Year Plan. On this occasion seven bulletins published by the IGFRI were released by the chief guest. In his remarks, Dr. Sharma, the guest of honour congratulated the IGFRI staff for the achievements and cautioned for the newer challenges waiting in future. He put emphasis on the development of the fodder bank on the line of food bank, or gene bank and appealed to the scientists to contribute in this endeavor through excellence in their discipline, so that real smile can be brought on the face of the poor farmers. In his chief guest's speech, Dr. Rai congratulated the staff of the IGFRI for walking several momentous steps together in different developmental activities and distinguishing it from the past. He called upon the scientific community to enhance the pace of the agricultural research for addressing the issues related to maintaining the purity of the five elements of the universe "Kshiti, Jal, Pawak, Gagan and samee". He appealed for the rational utilization of the natural resources so that the great vision of our national song “Sujalam Supahalam Malayaj Sheetlam...” could be realized in the future. He cautioned the scientific community to gear up to address the issues emerging due to accelerated economic growth in the country which warrant parallel growth in the products of animal origin. In coming years, to meet those demands we needs an annual 4-5% compound growth in the coarse cereals to meet the demand of the growing livestock sector. This can be achieved only through establishment of strong linkage between IGFRI and other AICRP/institution working on the mandated crops to develop the varieties efficient in forage and grain production as these two traits are mutually inclusive. He further stressed the need for linkage between the Institutes like National Institute of Nutrition and Animal Physiology, CSSRI, IVRI, NDRI to harness the positive interaction and broaden the knowledge base. He also emphasized the need for development of stress tolerant crop varieties efficient in utilization of water nutrients and other resources. IGFRI must strengthen the apomixes research so that it may be exploited across the crops to develop varieties affordable by the poor farming community. Techniques and technologies should be identified, models of partnership should developed to utilize problem soils like salt affected, acid soils, ravines and gullied land for development of forage resources. As remembrance of his visit, Dr. Rai also planted an Ashoka tree in the Technology Demonstration Park of the Central Research farm.
IGFRI welcomes Dr. S.K. Datta DDG (CS)

Dr. Swapan Kumar Datta, a distinguished scientist of international repute has assumed office as Deputy Director General (Crop Science), Indian Council of Agricultural Research. He is the first to develop and field evaluate hybrid Bt-rice, characterize the sh gene, pyramid transgenes and define their functions in rice. His pioneering efforts in developing golden indica rice, high-iron rice, Bt-rice, Xa-21 rice and PR-rice would stay as classics in rice biotechnology. Other contributions of Dr. Dutta include, development and demonstration of stable transgene expression of agronomically important genes using protoplasts, Agrobacterium and biolistic transformation. Before joining as DDG (CS), ICAR, Dr. Datta was serving University of Calcutta as Sir Rashbehari Ghose Chair Professor. He is recipient of several prestigious awards and recognitions, including Tata Innovation Fellowship from the Government of India, Panchanan Maheswan Medal in 2006 for significant contributions in Experimental Embryology and Plant Biotechnology. He has published over 125 research papers mostly in international journals, edited journals and books. His vast and successful experience in international and national agriculture science would to lead crop science research in the country to new horizons to achieve all round development. Indian Grassland and Fodder Research Institute welcomes Dr. Swapan Kumar Datta, the new Deputy Director General (CS).

Glimpses of Director General's Visit . . .
Carbon sequestration in grassland

In terrestrial ecosystems, quantity of carbon in the soil is normally higher than the quantity in living vegetation. Recent concern about global warming has led to attempts to estimate the effects of management on carbon sequestration in the soil. There is a need to understand the soil carbon dynamics and its role in terrestrial ecosystem, carbon balance and the global carbon cycle. Soil organic carbon (SOC) includes plant, animal and microbial residues in all stages of decomposition. Grasslands add greater SOC than under arable land owing to cultivation. Grasslands are important globally as a reservoir of C that might otherwise add to levels of atmospheric CO_2_. Grazing lands are estimated to contain 10-30% of the world's soil organic carbon. Grazing, fire and fertilization have been shown to affect soil C storage in rangelands. Carbon losses due to soil erosion can influence soil C storage on rangelands, both by reducing soil productivity in source areas and potentially increasing it in depositional areas, and by redistributing the C to areas where soil organic matter mineralization rates are different. Proper grazing management increases soil C storage and new grasslands have been shown to store as much as 0.6 mg C ha⁻¹ year⁻¹. Given the size of the C pool in grazing lands we need a better understanding of the current and potential effects of management on soil C storage.

When agricultural land is no longer used for cultivation and allowed to revert to natural vegetation or replanted to perennial vegetation, soil organic carbon can accumulate by processes that essentially reverse some of the effects responsible for soil organic carbon losses from when the land was converted from perennial vegetation. Loss of soil organic carbon by conversion of natural vegetation to cultivated use is well known. In recently established grasslands following a period of arable cropping, SOC exceeds the decomposition rate, resulting in a net accumulation of SOC.

In ecosystem that are more commonly used for cultivation, accumulation of light fraction organic carbon (LF-OC) can be quite high despite higher decomposition rates than where significant returns of plant litter from forests and permanent grasslands occur. The turnover of LF-OC in cultivated situation is linked to macro aggregate formation and its quantity is largely impacted by cropping and tillage. SOC is transformed by bacterial action and stabilized in clay or silt sized organomineral complexes (HF-OC). Time scale of turnover of HF-OC is on the order of decades. In permanently vegetated soils such as grasslands, silviculture and horticulture, above ground residues are left on the surface to decompose or a portion may be mixed into the soil by animal activity. Substantial gains in SOC are possible with conversion of cropland to grassland particularly with management for high grass productivity. SOC may accumulate at an average rate of 110 g C m⁻² year⁻¹ in the surface of 3 metre depth in temperate climate which may decline over time. In subtropical moist situation it was reported to be 33.2 g C m⁻² year⁻¹. SOC accumulations are much lower (21 g C m⁻² year⁻¹) under arid conditions. SOC is likely to increase when cultivated soil is planted with perennial grasses. Conversion of woody vegetation to grasses and replacement of native tropical savanna with high producing deep rooted exotic grasses can also result in significant SOC increases for several years (800 - 1300 g C m⁻² year⁻¹). At least for tropical moist and wet forest, it is possible for SOC to increase when native mature forest is cleared and converted to pasture at least for 10-20 years. Tropical dry forest showed decreases in SOC when converted to pasture.

Essential elements of what is known about soil organic matter dynamics that may result in enhanced soil carbon sequestration with changes in land-use and soil management needs to be understood. There will be a large amount of variation in rates and the length of time that carbon may accumulate in soil that are related to the productivity of the recovering vegetation, physical and biological conditions in the soil, and the past history of soil organic carbon inputs and physical disturbance. There will be maximum rates of C accumulation during the early aggrading stage of perennial vegetation growth. Average rates of accumulation are reported to be similar for forest or grassland establishment. However, these observed rates of soil organic C accumulation, when combined with the small amount of land area involved,

Mineralization and transfer of organic matter in soil (Christensen 1996)
are insufficient to account for a significant fraction of the missing C in the global carbon cycle that accumulate in the soils.

Long term experiments that address SOC dynamics when land is converted from cultivation with known management histories to perennial vegetation would be valuable in improving our understanding and increase our predictive capability over short and long time scales. There is not enough data available to predict regional SOC but enough information to infer order of magnitude of carbon sequestration rate. We can use the information to investigate some aspects of soil carbon fluxes in the present global carbon cycle. Recently, there has been interest in utilizing grasslands as pathways for terrestrial carbon sequestration. It is entirely reasonable to believe that grasslands can be utilized in both roles while still maintaining their ability to provide environmental services without degradation of grasslands. It mitigates the effects of CO₂ on global warming. However, some efforts to utilize grassland biomass to produce biofuels to reduce our dependence on fossil fuels appear to be in conflict with one another. The basic questions of how much carbon is sequestered in the biomass of different grasses, in its roots, in the soil on which these grasses grow and the total aggregates needed to be researched.

Various hypotheses have been proposed concerning the processes involved and regions where various processes may have greater or lesser effects on the rate of net carbon uptake. A linear relationship between the length of time in grass and the amount of SOC sequestered in the surface (60 cm) fit well for time periods from 6 to 60 years. The slope of this function provided an estimate of the carbon sequestration rate, in this case 447 kg C ha⁻¹ year⁻¹. At this rate, it would require nearly an additional century (98 years) for the 60 year grass site to reach a carbon pool equivalent to that of the prairie.

There are many factors and processes that determine the direction and rate of change in SOC content when vegetation and soil management practices are changed. Ones that may be important for increasing SOC storage include (1) increasing the input rates of organic matter, (2) changing the decomposability of organic matter inputs that increase LF-OC in particular, (3) placing organic matter deeper in the soil either directly by increasing belowground inputs or indirectly by enhancing surface mixing by soil organisms, and (4) enhancing physical protection through either intra-aggregate or organomineral complexes. Conditions favoring these processes generally occur when soils are converted from cultivated use to permanent perennial vegetation. To obtain a higher predictive capability of detecting changes in SOC, additional empirical studies are needed, combined with a better understanding of the biological and physical processes involved.

(K.A. Singh)
Director

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**Molecular marker linked to sexuality in Buffelgrass (Cenchrus ciliaris L.)**

Buffelgrass (Cenchrus ciliaris L.) is an important forage grass, which reproduces predominantly through apomorous apomixis. Sexual plant in C. ciliaris have been identified, using pistil-clearing technique. For genetic studies in apomixes obligate sexual plant is required. Molecular markers linked to apomixis have been reported in several grasses including C. ciliaris. Markers are important tool for genetic, cytogenetic and molecular analysis of apomixis. A Sequence Characterized Amplified Region (SCAR) marker linked to sexuality in buffelgrass was identified. A 300 bp amplicon unique to F₂ sexual progenies was cloned and sequenced. Primers were designed based on the sequence information as forward primer and reverse primer: Validation PCR was performed using genomic DNA from sexual plant (IGFRI-CcSx-08/1), sexual progenies (9), apomictic progenies (5) and facultative sexual progenies (2). The PCR conditions were: 94°C for 4 min followed by 39 cycles of DNA amplification (94°C, 1 min; 62°C, 1 min; 72°C, 1 min) and final incubation at 72°C for 10 min. The SCAR primers generated an expected 260 bp amplicon in the obligate and facultative sexual plants but not in the obligate apomictic plants (Fig.). Such type of marker will be useful in rapid screening of germplasm/ segregating populations for the mode of reproduction in C. ciliaris. If combined with apomixis-specific molecular markers (e.g. OPF08-600), it can help to identify obligate sexual and apomictic plants.

(Suresh Kumar, A Chandra, M.G. Gupta and G.P. Shukla)
Screening of oats genotypes for P mobilization from insoluble sources in acid soils

Acid soils are the largest group of problem soils occupying about 49 m ha cultivated area. Phosphorus is the major growth limiting nutrients in acid soil due to poor availability of native P and low use efficiency of the phosphate fertilizers. An attempt was made to identify suitable oat genotypes capable of efficient utilization of native and applied P by rhizospheric modification, for exploitation under acid soils. Twenty oat genotypes namely: Kent, JHO-2000-4, JHO-851, JHO 99-2, IG 03-460, JHO 852, IG 03-262, EC 246162, EC 209492, EC 209547, BGP 23, IGO 2-79, EC 209504, NDO 33, NDO 01, JHO 2008-3, JO-2005-78, SKO-109, OS-317, UPO-06-2 were planted in acid soils supplemented with four P sources: FePO₄, Ca₃(PO₄)₂, AIPO₄, NaH₂PO₄ and without P as control. All the genotypes differed in response to P sources, which was measured in terms of plant growth and shoot biomass production. Some genotypes like IG 03-262, EC 209492, SKO 109 etc. showed similar response to all the sources. While, Kent, JHO-2000-4, JHO-851 and JHO 99-2 showed better response to NaH₂PO₄ and Ca₃(PO₄)₂ but poor response to FePO₄ and AIPO₄ (Fig.1). Under control (native soil without external P supplement), leaves of most of the oat genotypes showed purple pigmentation resembling phosphorus deficiency except few genotypes, where it was absent conspicuously, indicating better utilization of P under stress conditions (Fig. 2). Considerable variability was observed in the oat genotypes in mobilization of P from different sources. The ability of some genotypes to utilize Ca₃(PO₄)₂ is noteworthy. Although, Ca bound P is generally low in acid soils yet it can be supplied through rock-phosphate. It may open the possibility of developing cultivars that can be fertilized more efficiently with rock-phosphate, a cheaper source of the P, than any other conventional P fertilizers.

Meetings of Fodder Sub Group of Advisory committee of Planning Commission

The first meeting of Fodder Sub Group of Advisory committee on Animal Husbandry and Dairy, Planning Commission, Government of India, New Delhi, was held under the chairmanship of Dr. K.A. Singh, Director IGFRI and Chairman at Planning Commission, New Delhi on June 4, 2009. The second meeting was held at IGFRI, Jhansi on June 24, 2009 and the third meeting was held at NDDB Anand on August 3-4, 2009. Other members of the committee, Dr. C.R. Hazra, Ex-Vice Chancellor, Shri Laxmi Narain Modi, Shri Atul Pathak and Dr. M. M. Roy, Convener of the Sub Group attended the meetings.
**Characterization of Sclerotinia trifoliorum and S. sclerotiorum**

*Sclerotinia* is an ubiquitous, necrotropic, omnivorous and sclerotial fungal pathogen causing root rot on almost all agricultural crops including forage crops. It becomes a devastating pathogen in winter season during wet period. The pathogen rapidly kills all above ground part of plants. Berseem (*Trifolium alexandrium*) as important forage crop is severely infected by the stem rot. The associated pathogen was reported as *Sclerotinia trifoliorum* Erk. in 1880. However, *S. sclerotiorum* (L.) de Bary has been reported on *T. repense* (white clover) which is closely related to Egyptian clover (Berseem). Similarly, both *S. sclerotiorum* and *S. trifoliorum* are reported on lucerne (*Medicago sativa*). Recent literatures still describe *S. minor*, *S. intermedia*, *S. trifoliorum*, *S. sativa* that are now considered synonyms with *S. sclerotiorum*. The pathogen has been reported on brinjal plant (*Solanum melongena*), and *Chinopodium* (*Chinopodium alba*) which is closely related to Egyptian clover (Berseem). *Sclerotinia trifoliorum* is universally described and well established as a necrotrophic pathogen causing root rot on all leguminous crops including forage crops.

### Methodology

Five *S. trifoliorum* isolates (1880) from Jhansi (1), Hisar (2, 3) and Ludhiana (4L, 7, 8) were collected. Two isolates of *S. sclerotiorum* were isolated from Deoria (UP). All these isolates were cross inoculated artificially on brinjal (*S. melongena*), Indian clover (*Trifolium alexandrium*) and brinjal (*S. melongena*). The pathogen was isolated from these inoculated hosts after complete rotting of the tissues. The colony characters, growth rate, sclerotial size and its developmental pattern were compared with the original native culture. The results revealed that radial growth on potato dextrose agar medium at 12-15°C temperature was 30.2 mm to 47.5 mm after three days of incubation. Lowest growth was observed in brinjal isolate (7) while maximum radial growth was in berseem isolate (4S). Statistically, isolates 2, 3, 4S were at par.

Similarly, 4L, 7, 8 were also at par. A similar trend of colony growth was recorded after five days of incubation. Interestingly the original berseem isolate native to Ludhiana changed distinctly its colony characters from creamy white, sparse, numerous small sclerotia (4S) to white, compact, few, large sclerotia (4L) in sub culturing. There was no significant difference in colony colours and sclerotial initiation period. The colony colour was white, compact regular in most of the isolates (2, 3, 4L, 7, 8) while creamy white, sparse, regular in 1, 4S. There was no definite pattern of arrangement and size of sclerotia. The associated pathogens were established as *Sclerotinia trifoliorum* Erk. in 1880. However, *S. sclerotiorum* (L.) de Bary has been reported on *T. repense* (white clover) which is closely related to Egyptian clover (Berseem). Similarly, both *S. sclerotiorum* and *S. trifoliorum* are reported on lucerne (*Medicago sativa*). Recent literatures still describe *S. minor*, *S. intermedia*, *S. trifoliorum*, *S. sativa* that are now considered synonyms with *S. sclerotiorum*. The pathogen has been reported on brinjal plant (*Solanum melongena*), and *Chinopodium* (*Chinopodium alba*) which is closely related to Egyptian clover (Berseem). *Sclerotinia trifoliorum* is universally described and well established as a necrotrophic pathogen causing root rot on all leguminous crops including forage crops.

### Results and Discussion

The pathogen rapidly kills all above ground part of plants. Berseem (*Trifolium alexandrium*) as important forage crop is severely infected by the stem rot. The associated pathogen was reported as *Sclerotinia trifoliorum* Erk. in 1880. However, *S. sclerotiorum* (L.) de Bary has been reported on *T. repense* (white clover) which is closely related to Egyptian clover (Berseem). Similarly, both *S. sclerotiorum* and *S. trifoliorum* are reported on lucerne (*Medicago sativa*). Recent literatures still describe *S. minor*, *S. intermedia*, *S. trifoliorum*, *S. sativa* that are now considered synonyms with *S. sclerotiorum*. The pathogen has been reported on brinjal plant (*Solanum melongena*), and *Chinopodium* (*Chinopodium alba*) which is closely related to Egyptian clover (Berseem). *Sclerotinia trifoliorum* is universally described and well established as a necrotrophic pathogen causing root rot on all leguminous crops including forage crops.

### References

Bale formation of dry grasses and hay using mobile type densification machine

A mobile type densification machine was evaluated at different locations in the IGFRI research farm for making bales of mixed natural grasses. This densification machine was operated by a 35 hp tractor and was mounted on an axle having two pneumatic tires. One end of the machine had hook for single point hitching with the tractor, making it able to be transported from one place to another under field conditions. The baling outlet was of square cross section of 47x47 cm in which length of the bales can be kept variable depending upon the type of baling material, mode of transportation of bales etc. The grasses were dried to the moisture content in range of 11.5 to 12.8 per cent and then baled with this machine. In the process of baling, dry grass was fed to the hopper of this machine and pushed mechanically with a wooden stick so as to come in the path of moving ram. When sufficient length (minimum 40 cm) was achieved in the pressing chamber, a wooden separation plank was put before loading the new material in to the hopper. In the wooden planks, two slots were made through which a wire was inserted using needle. The wire was taken back through the slots made in the next separating plank and tightened with the ends so that it gives definite shape to the bale. The process is repeated two times so that one bale is tied with two wires. The ram forces bale in the forward direction when more grasses are put inside the chamber. One hundred and two trolleys of natural grasses were collected from the rangelands of IGFRI research farm in the month of Jan-Feb, 2009, weighing about 35 tonnes. The length of bales were kept from 40 to 100 cm. The weight of bale of 47x47x50 cm was 16.3 ± 10 kg per cent. It was possible to get the bale weight in the range of 15 to 35 kg by varying the length. The bales thus made had an average density of 147.4 kg/m³. This density was less than that of bales formed by stationary type IGFRI densifying machine. This machine is useful when electrical power supply is not available and the cut grasses are scattered in the field. In this process, four labour were used for collecting the stored grasses and feeding it into the machine, tying the bales, keeping the bales aside and operation of tractor and machine. This machine saves three times the storage space as compared to loose grasses. In addition three times more material can be transported in a tractor trolley weighing approximately 9.66 quintals as against 3.5 quintals of loose grass.

(P K Pathak, C S Sahay, P N Dwivedi, V D Chhavda and Rajesh Sharma)

Cheap balanced forage rations developed for growing heifers

The viability of animal husbandry sector depends on the economic feeding which account for 65-80% of total farm expenditure. But increasing prices of various conventional animal feeds, has made it difficult to bring down the feeding cost. Under such situations, feeding cost could be reduced either by incorporating unconventional feeds in the ration or by eliminating costly ingredients from the concentrate mixture. Accordingly, various unconventional feeds were tried with limited success and they were neither recommended as sole feed nor for long term feeding. In the present investigation, an attempt was made where costly feed ingredients were either partly or completely replaced in the ration. A feeding trial was conducted on 15 growing heifers, divided into 3 groups (G₁ to G₃) of 5 animals in each. Heifers under G₁ group received a normal concentrate mixture (barley: wheat bran: mustard cake: salt: mineral mixture in ratio of 50: 13: 35: 1: 1), while animals under G₂ group received an economic concentrate mixture where 100% of barley grain and 50% of mustard cake was replaced with cheaper ingredients like wheat bran, subabul leaf meal (SLM) and urea. Animals in G₃ group also received another economic concentrate mixture where both barley grain and mustard cake was completely replaced with wheat bran, SLM and urea. All the experimental animals were kept on composite rations of concentrate mixture and wheat straw to meet the protein requirement for 450 g average daily gain and continued for 150 days. Costs of each kg of concentrate mixture were Rs. 8.48, 6.60 and 6.36 for growing heifers of G₁, G₂ and G₃ groups, respectively. Average daily dry matter intake was similar among the groups ranging from 5.46 to 5.61 kg. Similarly, CP and TDN intakes were comparable amongst the groups, and ranged from 8.62 to 8.68 and 51.43 to 54.77 g per kg W 0.75, respectively. Average daily gain in growing heifers was 448, 408 and 409 g in G₁, G₂ and G₃ groups, respectively and the differences were non-significant. This showed that inclusion of wheat bran, SLM and urea replacing barley grain and mustard cake (even up to 100%) did not have any adverse effect on body weight gain. The feed efficiency per kg live weight gain was 12.85, 14.34 and 14.56 kg in growing heifers of G₁, G₂ and G₃ groups, respectively and the differences were non-significant. Hence it was concluded that cost of feeds consumed was significantly high (Rs.3911) in heifers fed normal concentrate mixture (G₁) than those fed on economical concentrate mixtures (G₂ and G₃ groups) during 150 days of experimental feeding. Hence, heifers can be reared economically on feeds like grain milling by-products and forages, which are non-competitive with human foods.

(S K Mahanta and Shweta Singh)
**Forewarning of zonate leaf spot disease of sorghum**

Zonate leaf spot induced by fungus *Gloeocercospora sorghi* is an important foliar disease of sorghum which generally appears in severe form during southwest monsoon season (July-Sept.) in North India. Under favourable environmental conditions, the disease can destroy large areas of tissue and thus reducing forage yield and quality. Initially zonate leaf spot symptoms are small, reddish brown and water soaked spots. The lesions enlarge and become circular with alternating bands of dark purple or red color to give a zonate appearance.

Epidemic of zonate leaf spot is greatly influenced by the prevailing weather variables, and the disease prediction can be made based on weather variables and the previous disease level. The sigmoid curve with variable growth rate of polycyclic diseases is clumsy to handle in mathematical terms to develop prediction models. Hence, to achieve linearity, it is necessary to transform disease progress data by fitting certain functional models.

A field experiment was conducted during three consecutive rainy (*kharif*) seasons at Central Research Farm of Indian Grassland and Fodder Research Institute, Jhansi. The disease severity was recorded weekly through non-destructive sampling of ten randomly selected plants at 7 days interval starting from the first appearance of disease till harvest. The severity was observed on 0-9 scale and per cent disease severity was calculated. The disease data was linearized by using

\[ \text{Logit} (y) = \ln \left( \frac{y}{1-y} \right) \]  
and

\[ \text{Gompit} (y) = - \ln (- \ln(y)) \] functions.

The influence of major weather variables showed that the maximum temperature (30.4 - 36.6 °C), minimum temperature (20.6 - 25.7 °C) and evening relative humidity (54-75%) significantly influenced the disease growth at all the stages of crop growth. Weather-disease interaction reflects that antecedent one week maximum temperature \((r = 0.52)**, evening relative humidity \((r = 0.37)*\), sunshine hours \((r = 0.58)** and previous disease level \((r = 0.93)** showed favourable response, whereas, minimum temperature \((r = -0.62)** and wind speed \((r = -0.47)** showed unfavourable response to disease severity for Gompertz transformation. Similar trend was also observed in logistic transformation. This clearly demonstrates that disease progress data is well correlated with transformed disease severity. The multiple regression equation between transformed disease severity, weather parameters and previous disease level indicates that Gompertz transformation exhibit better prediction capabilities as evidenced by high \(R^2\), low standard error and residual sum of squares. Thus, the Gompertz model can be effectively utilized in weather based forecasting model for zonate leaf spot disease of sorghum for its effective management.

(J B Singh, Pradeep Saxena, K C Pandey and Pradeep Behari)

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**Deputy Director General (Crop Science) visits IGFRI Regional Research Centre, Dharwad**

Dr. Swapan Kumar Dutta, DDG (Crop Science), ICAR visited IGFRI Regional Research Centre on September 21, 2009. He appreciated the work being carried out at the centre. He said that the madate of crops of the Institute at Dharwad was important in ensuing the need of fodder and grasses for animal feeds. The Research Centre is strategically located to cater the needs of peninsular India. He felt that the centre requires restructuring and facilities, manpower are also required. He was impressed with the dedication shown by the staff of the centre.
Supplementation of complete feed pellets (CFPs) in milch cows maintained on grazing based feeding system

In Bundelkhand region milch animals are provided with only 50-70% of protein and 70-80% of TDN (energy) requirements due to non-availability of adequate green forage and limited quantity of concentrate feeding. Hence, farmers maintaining mostly low to medium milk yielding animals need to augment the protein as well as energy supply by supplementing both forages and concentrates to improve the production performances. Accordingly efforts were made to improve the production performances of milch animals by strategic supplementation of complete feed pellets (CFPs) and to demonstrate the farmers about the cost effectiveness of supplementing CFPs for improving milk production. Based on the survey and available information on ongoing feeding system in grazing animals (bovines), complete feed pellets (CFPs) were prepared with locally available feed resources like wheat straw, groundnut leaves, barley, mustard cake and wheat bran. CFPs comprised of 30% wheat straw, 10% groundnut leaves and 60% concentrate mixture. The concentrate mixture was prepared with 26% barley, 34% wheat bran, 38% mustard cake and 2% area specific mineral mixture. Thus prepared CFPs contained 12-15% CP and was used as strategic supplement to improve the productive performances in grazing animals in Bilta village. Lactating cows supplemented with CFPs for 165 days produced 26% more milk than those of without supplementation. However, CFPs supplementation did not have any influence on milk composition. The return received from sale of milk was significantly (P < 0.05) more in milch animals supplemented with CFPs. The net return/ benefit due to supplementation of CFPs was Rs. 3.50 per cow per day more than the traditional feeding systems. Hence, supplementation of CFPs had positive effect on milk production in cows reared on grazing and low quality cereal straws/ stovers. It has the potential to increase the viability of dairy farming and increase household incomes. But there is need to create awareness among the farmers about strategic supplements, and availability of complete feed pellets should be ensured in the villages.

(S K Mahanta and Anil Kumar)

IGFRI, Scientist elected as Fellow, NAAS

Dr. Ajoy Kumar Roy, Principal Scientist (Genetics) and Head, Grassland and Silvipasture Management Division, IGFRI, Jhansi was elected as Fellow, National Academy of Agricultural Sciences, New Delhi in the area of Crop Sciences for his contribution in forage crop research. He was presented with a memento and a certificate during the Annual General Meeting of National Academy of Agricultural Sciences held at New Delhi on 4-5th June, 2009.

Joint session of Institute Management Committee and Quinquennial Review Team of IGFRI

IGFRI, Institute Management Committee meeting was held on September 12, 2009. Dr. S.K. Gupta, Shri Sharma Puran and others attended the meeting. On this occasion Dr. S.D. Rai, Chairman and Dr. H.S. Nainawatee, member of Institute QRT were also present and they presented the salient recommendations of the QRT for the period 2003-07.

April–September 2009
<table>
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<tr>
<th><strong>IGFRI Scientists visit abroad</strong></th>
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<tr>
<td><strong>Dr. Amresh Chandra</strong>, Principal Scientist visited Institute of Biological Environmental and Rural Sciences (IBERS), Aberystwyth University, UK from Jan 21 to Feb 17, 2009 under INSA-Royal Society London inter-academy exchange programme. During the visit Dr Chandra had discussion on different aspects of association in genetics and also presented a paper on Indian forage research. The linkage with scientists in UK also provided an opportunity to plan and develop international project on related topic.</td>
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<tr>
<td><strong>Dr. D.R. Malaviya</strong>, Principal Scientist and Head, Division of Seed Technology, visited Australia for training on &quot;Agriculture Biotechnology&quot; at Pasture Genetics and Improvement E II Graham Centre for Agricultural Innovation (NSW Department of Primary Industries and Charles Sturt University), Wagga Wagga Agricultural Institute, PMB, Pine Gully Rd, Wagga Wagga NSW 2650 for a period of three months from 25th March to 24th June 2009 under DBT Overseas Associateship Award for 2007-08 program.</td>
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<tr>
<td><strong>Dr. Sultan Singh</strong>, Senior Scientist, Division of Plant Animal Relationship is on visit abroad to Germany for training on, &quot;Animal Nutrition&quot; at Institute of Animal Sciences, University of Bonn for a period of three months from September 14 to December 13, 2009 under INSA International Collaboration/Exchange Programme.</td>
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<td><strong>Dr. Suresh Kumar</strong>, Senior Scientist (Biotechnology) visited University of Missouri, Columbia, USA, availing Norman E. Borlaug Fellowship under the International Agricultural Knowledge Initiative - a prestigious award sponsored jointly by ICAR and USDA for six-weeks during April 11 to May 25, 2009 for a training on &quot;Deployment of microRNA for enhanced abiotic stress tolerance in plants. He worked with Prof. Han B. Krishnan in his world-class molecular biology laboratory on deployment.</td>
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<td><strong>Dr. Asim Kumar Misra</strong>, Principal Scientist, Division of Plant Animal Relationship, visited Institute de la Recherche Agronomique (INRA Centre Theix), Clermont-Ferrand, France for 6 months (From 22nd February 2009 to 21st August 2009) under Biotechnology Overseas Associateship 2007-08 of Department of Biotechnology, Ministry of Science and Technology, Government of India, in the field of food and feed biotechnology.</td>
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<tr>
<td><strong>Dr. Anil Kumar</strong>, Senior Scientist, Division of Plant Animal Relationship, visited Canada availing DST’s BOYCAST Fellowship 2008-09 program for a period of four months from 25th May to 20th September 2009 at Department of Animal &amp; Poultry Sciences, University of Guelph, Canada. He worked with Prof. Brian Mc Bride on modelling with CPM-Dairy and advanced nutritional analysis of Chaya.</td>
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### Visit of Shri Ramadhar, Ex Chairman Bihar State Farmers Commission

Shri Ramadhar ji, Ex Chairman, Bihar State Farmers’ Commission visited IGFRI during September 3-5, 2009. He expressed happiness on the research facilities and activities of the Institute. He also interacted with the farmers while visiting the FSRP sites at Radhapur and Ladpura villages of Tikamgarh district (MP). He also addressed a group of trainees from Bhagalpur, Bihar. He shared his experiences of 19 years tenure at FAO Rome, with the scientists of the Institute and narrated his visionary guidelines for development of Indian agriculture.
IGFRI, Jhansi and Development Alternatives join hands for integrated development under “Farming System Research Project”

Indian Grassland and Fodder Research Institute (IGFRI), Jhansi and Development Alternatives (DA), Jhansi—a Non Governmental Organization have entered into an agreement for collaborative approach towards overall agricultural development under “Farming System Research Project”. IGFRI, Jhansi is engaged in carrying out research and developmental activities under Farming System Research Project in four villages (Radhapur, Bagan, Ladpura and Maharajpura) of Tikamgarh district. Development Alternatives, Jhansi has expertise in conducting developmental activities in villages and has agreed to disseminate the technology offered by IGFRI, Jhansi in the villages selected under farming system research project. The primary focus of the project is livestock development through improved supply of quality fodder and breed improvement. A series of training and extension programmes have been envisaged to be taken up jointly.

Human Resource Development activities at IGFRI, Jhansi

April 20-23, 2009 (a) Training of scientific personnel (b) Training of technical personnel

Training on Livestock Management, fodder development and utilization by UPDASP, August 4-11, 2009

Management Development Programme on “Quantitative decision making techniques for grassland and fodder research” organised at Indian Institute of Forest Management (IIFM), Bhopal for scientists of IGFRI, during June 22 to 26, 2009 - in which ten Senior Scientists of IGFRI participated.

Visits conducted

International
HRD unit conducted visit cum training of a delegation from NARC Nepal from May 6 to 8, 2009.

National
- Mr. Madhav Roy, Programme Officer, NEEDs (NGO), Ranchi visited IGFRI from April 23 to 25, 2009.
- The HRD unit conducted visits cum training of farmers sponsored by PACT -UP Water Sector Restructuring Project, Lucknow, UP in 7 batches of 20-25 each on June 11, 15, 17, 19, 22, 24, 26, 2009.
- Mr. Atul Pandya, Programme Director (Rural Programme), alongwith 3 officers of Centre for Environment Education, Nehru Foundation for Development, Ahmedabad, visited IGFRI on May 20, 2009.

Best Poster - 1st Prize
Impact of different land use systems on Soil properties and runoff losses in the water shed by S.B. Tripathi, R.B. Yadav and Arvind K. Rai. In the conference on “Food and environment security through resources conservation in central India challenges and opportunities at CSWCRFI, Research Centre, Agra from 16-18 Sept’09 certificates were distributed by Dr. A.K. Singh, DDG NRM, ICAR, New Delhi.
संस्थान में हिंदी सप्ताह 2009 का आयोजन

संस्थान में 14 से 19 सितंबर, 2009 का हिंदी सप्ताह का आयोजन किया गया। इसका प्रमुख लक्ष्य हिंदी में कार्य करने वालों के लिए हिंदी में सारधित कार्य करने का समय देने और दक्षता विकास करने का समय प्रदान करना है। इसके अलावा प्रशिक्षण कार्यक्रम के समय भाषा के अभ्यास करने का समय दिया गया है। यह सप्ताह विभिन्न विभागों में हिंदी में कार्य करने की उपरोक्ताओं को समय देने में मदद करेगा।

विकल्प हेतु उत्तम श्रेणी योज

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