

# Forage Legumes

*Editors*

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## ***About the Editors:***

**Late Dr. Jai Vir Singh** worked on various forage crops and guar as Senior Scientist (Plant Breeding) at CCS Haryana Agricultural University, Hisar. He was engaged in the research work related to guar and forage crops since last 27 years. He has contributed to the development and release of varieties viz., HG-182, HFG-156, HG-258, HG-365, HG-563 and HG 2-20 of guar, HM-65 of Methi and HFWS-55 of Senji. He has published more than 100 research papers in national and international journals of repute. He was one of the authors of the books : 'Practical Plant Breeding Manual', 'Guar Production and Its Utilization in India' and 'Guar'. He was one of the recipients of "Rafi Ahmad Kidwai Memorial Prize for Agricultural Research for the biennium 1982-83". He visited USA under AHRD Faculty Development Programme and worked on Molecular markers of guar. He was Principal Investigator of two projects funded by NATP and APEDA. He was the Vice-President of "The Indian Arid Legumes Society", Jodhpur and Editor of "Forage Research" journal.

**Dr. Balbir Singh Chhillar**, an eminent scientist, teacher, extension specialist and successful administrator started his carrier as Asstt. Professor, 1971. He provided guidance and leadership as District Extension specialist, extension specialist (Entomology), Senior Co-ordinator in extension, Associate Dean (Post Graduate Studies), Professor and Head-cum-Director, Centre of Advanced Studies, Department of Entomology and presently, Director of Research, CCS HAU, Hisar. As researcher, he has provided technology for very effective biological control of sugarcane leaf hopper (*pyrilla*), established the cause of yellowing of sugarcane crop in post monsoon period and also established the bio control laboratory at co-operative sugar mill Sonipat (Haryana) A number of recommendations based on his research found place in the University package and practices like chemical control of sugarcane black bug, early shoot borer, root borer and grass hopper in sorghum and sugarcane crops. Associated in release of sugarcane varieties CoH 35, CoH 56, CoH 99 and CoH 108. Published 44 research papers, 46 popular articles, 5 manuals, 11 course compendia, 8 technical bulletins and two books on entomology. Dr. Chhillar, decorated with **Best Teacher Award (ICAR)** in 2003-04 and guided 23 PG students (M.Sc. and Ph.D.). He visited to USA for advanced training on IPM, sugarcane.

**Dr. B.D. Yadav**, an eminent scientist, born in 1950 (Dist. Mahendergarh, Haryana) and joined Haryana Agricultural University, Hisar in 1975 as Research Assistant (Agronomy). At present he is working as Sr. Scientist (Agronomy) in Forage Section, CCS Haryana Agricultural University, Hisar. He is engaged in the research work related to forage crops and Arid Legumes since last 21 years. Dr. Yadav contributed significantly in the development of package and practices of various forage crops and has 10 recommendations on different agronomical aspects. He has published more than 75 research papers in the journals of repute. He has also written more than eight chapters for different books and proceedings of the symposia and guided three PG students.

**Dr. U.N. Joshi** worked on various forage crops and guar as Senior Scientist (Biochemistry) at CCS Haryana Agricultural University, Hisar. He is engaged in the research work related to guar and forage crops since last 29 years. He has contributed to the quality work for development and release of varieties viz., HG-182, HFG-156, HG-258, HG-365, HG-563 and HG 2-20 of guar, HM-65 of Methi and HFWS-55 of Senji. He has published more than 90 research papers in national and international journals of repute. He is one of the authors of the book : Environment-111. He is recipients of "Rafi Ahmad Kidwai Memorial Prize for Agricultural Research for the biennium 1982-83", "ICAR Team Research Award on Forage Sorghum for the biennium 1983-84 and also received Jawaharlal Nehru Award For best Post Graduate Resesearch" for the year 1991. He was Principal Investigator of project funded by ICAR and Co PI of project funded by NATP and MFPI. He is also looking after the work of Secretary, Indian Society of Forage Research.

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*Dedicated*  
*in the Memory of*  
***Late Dr. Jai Veer Singh***

## Forward

In India livestock rearing play a significant role in the national economy, the animal population is 485 millions excluding poultry and dogs. Animal performance and production depends upon quality and quantity of feeds and fodders. Forage crops generally include annual and perennial legumes and grasses. Forages contain significant portions of plant cell wall material (Cellulose). Ruminants can digest these cellulosic materials (through bacteria and other microorganisms in their digestive tract) into utilizable nutrients. This ability is extremely important, since cellulose is one of the most abundant material on the earth. Forages, especially the perennial legumes and grasses make a valuable contribution towards supply of nutrients for animals, conserving soil and water resources and contributing into pollution control of natural resources (soil, water and air). Forage legumes, improves soil health by their ability of symbiotic nitrogen fixation. Forage legumes foliage is usually rich in proteins.

In India, agriculture and animal husbandry are integrated to each other and its scenario is expected to continue in the foreseeable future. Forage cultivation is restricted to only four per cent of the cultivable area in the country. This is due to the majority of small and marginally farmers and high pressure on cultivable land which leads to the deficiency of feeds and fodders for livestock. The shortage of dry and green fodders are 40 and 24 per cent against total requirements of 650 and 761 million tons for the 485 millions livestock population, respectively. Therefore, there is need for improvement of fodder production on quality to maintain national economy.

I appreciate the efforts of Late Dr Jai Vir Singh, Sr. Scientist (Plant Breeding), Dr. B.S. Chhillar, Director of Research., Dr. B.D. Yadav, Sr. Scientist (Agronomy) and Dr U.N. Joshi Senior Scientist (Biochemistry) for brining out valuable information on forage legumes in book form entitled as "Forage Legumes". The information provided in this book will be certainly helpful for students, scientists, teachers, farmers and planners associated with improvement, production and utilization of forage crops as well as animal production.

**Dr Amar Singh Faroda**

Former Chairman,  
Agricultural Science Recruitment Board,  
Indian Council of Agricultural Research, New Delhi

## Preface

Forage crops are important for the economy of our country as these crops provide major nutritional base in the livestock ration. The National Commission on Agriculture has also emphasized in its report that in order to achieve the so-called '**White Revolution**' it will be necessary to provide required emphasis on research relating to the improvement and management of forages. India's average availability of milk per head per day comes to only 100 ml as against our requirement of 220 ml per day. With the increase in world human population and economic growth, the demand for animal products such as milk, meat and eggs in the human diet is bound to increase. The success of dairy and poultry programmes will largely depend on the availability of required forages and feeds since almost 60-65 per cent investment is invariably on these essential requirements. A recent estimate indicates that the deficiency in total forage need is about 40 per cent of dry forage and about 24 per cent of green fodder. This deficit is likely to increase further as (i) the area under forage crop is declining because of the pressing problems of growing cereals and other cash crops to meet the increasing pressure of population growth, (ii) the animal population is increasing every year by almost 2 per cent (iii) cultivable land is decreasing due to urbanization and industrial growth and (iv) forages in future are going to have competition from liquid fuel shortage. Recent interests in the development of technology for the economic conversion of cellulosic material to liquid fuels, however, have given rise to estimates of several hundred million metric tons of lignocellulosic material being used annually for their new developments. With the development of these technologies, the impact on ruminants production would be substantial, so there is going to be a vital challenge to meet the requirement of forages in the near future.

In this book entitled as "Forage Legumes" the efforts have been made to collect and compile the information related to forage legumes so, that same may be utilized by students, scientists, teachers, farmers and planners.

**Jai Vir Singh**  
**B.S. Chhillar**  
**B.D. Yadav**  
**U.N. Joshi**

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