RPF-1

PROFORMA FOR SUBMISSION OF RESEARCH PROJECTS
PART-1: GENERAL INFORMATION

200 Project Code

2001 Institute Code No. **7.11**

2002 ICAR Code No.

201 Name & Address of Institute **INDIAN GRASSLAND & FODDER RESEARCH INSTITUTE, JHANSI-2840003**

2012 Name of Division/Section: **Crop Improvement Division**

2013 Location of project: **Central Research Farm, IGFRI, Jhansi**

202 Project Title: **" Biochemical and Molecular Approach for Characterization of Drought Tolerant Forage Sorghum"**

203 Priority Area

2031 Research Approach: **Applied Res. Basic Res.** Process/or Technology Development Transfer of Technology

√01 **√ 02** 03 04

204 Specific Area: **Plant Biochemistry & Plant Molecular Biology**

2041 Various Project/ Projects in this specific area: **No systematic work was carried out at the institute farm.**

205 Duration: **5 years**

2051 Date of start: **July 2010**

2052 Likely date of completion: **June 2015**

206 Total cost of Project

2061 Foreign Exchange Component (if any): **NIL**

207 Project Profile Summary:

Sorghum (*Sorghum bicolor* L.) is an important crop in many parts of the world. It is utilized as food, fodder and several industrial purposes. In general, sorghum is known to be ore tolerant to any stresses including heat, drought, salinity and flooding (Ejeta and Knoll, 2007). Drought, one of the most severe stresses, results in a considerable loss of crop productivity. Development and selection of drought tolerant forage sorghum is very much required to ensure the fodder availability in drought prone areas of country. The forage sorghum germplasm at IGFRI comprising of stay green, high sugar content and low HCN will be screened at physiological and biochemical level for their tolerance to drought. Selected sorghum lies will be characterized at molecular level. The selected lines will be introduced into drought prone area for forage production in the extreme environmental conditions.

208 Key words: Drought, forage sorghum, antioxidant enzymes, chlorophyll.

PART-II: INVESTIGATOR PROFILE

210 Principal investigator:
2101 Name: **Dr Manoj Kumar Srivastava**
2102 Designation: Sr Scientist (Plant Biochemistry)
2103 Division/Section: Crop Improvement Division
2104 Location: CR Farm, Glass House and Biotechnology Lab at IGFRI, Jhansi
2105 Institute Address: Indian Grassland and Fodder Research Institute, Jhansi

211 Co-investigator:

2111 Name: Dr. Dinesh Chandra Joshi.
2112 Designation: Scientist (Breeding)
2113 Division/Section: Crop Improvement Division
2114 Location: CR Farm, Glass House and Biotechnology Lab at IGFRI, Jhansi
2115 Institute Address: Indian Grassland and Fodder Research Institute, Jhansi

212 Co-investigator:

2121 Name: Dr. Suresh Kumar.
2122 Designation: Senior Scientist (Biotechnology)
2123 Division/Section: Crop Improvement Division
2124 Location: Glass House and Biotechnology Lab at IGFRI, Jhansi
2125 Institute Address: Indian Grassland and Fodder Research Institute, Jhansi

213 Co-investigator:

2131 Name: Dr. _____
2132 Designation: Senior Scientist (Plant Physiology)
2133 Division/Section: Crop Improvement Division
2134 Location: Glass House and Biotechnology Lab at IGFRI, Jhansi
2135 Institute Address: Indian Grassland and Fodder Research Institute, Jhansi

221 Project Technical Profile:

2211 Organization of Work Elements (for such objective and participating Investigator giving man-months Involved)

PI : Collection of seeds of different germplasm lines of sorghum, land preparation, sowing, characterization and evaluation of sorghum at morphological and physiological level for drought tolerance, biochemical characterization of these lines, Isolation of DNA and RNA, Preparation of cDNA, Expression analysis of drought related genes using Reverse transcriptase PCR (48 months)

Co PI-1: Collection of seeds of different germplasm lines of sorghum, land preparation, sowing, characterization and evaluation of sorghum at morphological and physiological level for drought tolerance, Selection of contrasting lines for breeding, crossing and generation of lines for mapping(24 months)

Co PI-2: Isolation of DNA and RNA, Preparation of cDNA, Expression analysis of drought related genes using Reverse transcriptase PCR (24 months)

Co PI-3: Physiological characterization of different lines of sorghum (24 months)

2212 Methodology:

Plant material- Stay Green lines of Sorghum,
Carbohydrate rich materials, low HCN materials, and Released varieties.

Treatments- Water stress at various stages of growth (drought)

E1- Irrigated condition

E2- Water stress condition

Design: Augmented.

One set in pots will be placed inside the Glass-House/ Net House.

2213 Plan of Action:

First year

1. Screening and selection of lines of forage sorghum for their tolerance to drought stress (in field).
2. Morphological and physiological characterization of these lines
3. Biochemical investigation of protein, chlorophyll and carbohydrates in these lines.

Second year

1. Re- evaluation of lines of forage sorghum for their tolerance to drought stress (in field).
2. Growth and morpho- physiological performance of best lines selected from first year screening under controlled condition (pot experiments in glass house).
3. Profiling of antioxidant enzymes viz. Catalase, peroxidase, SOD, Polyphenol oxidase, esterase and glucosidases.
4. Isozyme analysis of above enzymes during drought stress

Third year

1. Enzymatic profile of antioxidant enzymes viz. Catalase, Peroxidase, SOD, Polyphenol oxidase, esterase and glucosidases (validation).
2. Isozyme analysis of above enzymes during drought stress (validation).
3. Isolation of genomic DNA and development of molecular marker associated with drought.
4. Crossing of identified tolerant and susceptible plants to develop F_1.

Fourth year

1. Isolation of genomic DNA and development of molecular marker associated with drought.
2. Isolation of RNA and preparation of cDNA from different tissues of sorghum.
3. Selfing of F_1 plants to develop F_2 and backcrossing with the parents for developing BC (P_1) and BC (P_2).

Fifth year

1. Expression analysis of stress related genes.
2. Characterization of different drought stress related proteins in sorghum.
3. Development of $F_{2:3}$ populations from the F_2 set and generation mean analysis of the six generations derived in earlier years.

2214 Time Schedule of Activities (Milestones):

Year	Activity
July 2010	Collection and sowing of germplasms, morphological and physiological characterization of these lines
2011	Growth and morpho- physiological performance of best lines selected from first year screening under controlled condition (pot experiments in glass house).
2012	Enzymatic profile of antioxidant enzymes viz. Catalase, Peroxidase, SOD, Polyphenol oxidase, esterase and glucosidases. Isozyme analysis of above enzymes during drought stress . Crossing of identified tolerant and susceptible plants to develop F_1.
2013	Isolation of genomic DNA and development of molecular marker associated with drought. Isolation of RNA and preparation of cDNA from different tissues of sorghum.
2014-15	Characterization of different drought stress related proteins in sorghum. Development of $F_{2:3}$ populations from the F_2 set and generation mean analysis of the six generations derived in earlier years. Statistical analysis of quantitative data and report writing.

PART-V: DECLARATION

This is to certify

- The Research work proposed in the scheme/project does not in any way duplicate the work already done or being carried out in the Institute on the subject.
- The same project has been/has not been submitted to any other agency (ies) for financial support (if already submitted identify Project & Agency).
- The Investigator/co-investigators have been fully consulted in the development of project and have fully undertaken the responsibility to carry out the programme as per the technical programme.

M.K. Srivastava 28/07/2010

Signature of the Project Investigator
(Manoj Kumar Srivastava)

Co-investigators **1.**

Dgoshi 30/7/10

(Dinesh Chandra Joshi)

2.

Suresh Kumar

(Suresh Kumar)

3.

The Project proposal has been approved in the IRC (_____)

Signature & Comments of the Head of the Division/Section

विभागाध्यक्ष
for HEAD OF DIVISION
फसल सुधार विभाग
CROP IMPROVEMENT DIVISION
भारतीय चरागाह एवं चारा अनुसंधान संस्थान, झाँसी
Indian Grassland & Fodder Research Institute, Jhansi

30/07/10
for HD/CI

Signature & Comments of Joint Director (Research)

Checked & Forwarded
Sanjay Kumar
31-07-2010

PMER

Signature & Comments of Director

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