

**Guidelines for the conduct of tests
for Distinctiveness, Uniformity and Stability**

Barnyard millet (*Echinochloa frumentaceae* (Roxb.) Link)



Protection of Plant varieties and Farmer's Rights Authority

Government of India

Barnyard millet (*Echinochloa frumentaceae* (Roxb.) Link)

I Subject:

These test guidelines apply to all the varieties, hybrids and parental lines of Barnyard millet (*Echinochloa frumentaceae* (Roxb.) Link)

II Material required:

1. The Protection Plant Varieties and Farmers' Right Authority (PPV & FRA) shall decide when, where and in what quantity and quality of the seed material is required for testing a varietal denomination applied for registration, under The PPV & FR Act 2001. Applicants submitting such seed material from a country other than India shall make sure that all customs and quarantine requirements stipulated under relevant National legislations and regulations are complied with. The minimum quantity of the seed material to be supplied by the applicant shall be 250 grams. The seed shall be packed and sealed in ten equal weighing packets of 25 grams each and submitted in one lot. In addition, 10 panicles need to be submitted, if required.
2. The seeds submitted shall have the following standards:
 - a. Germination : 80% (Minimum)
 - b. Moisture content : 12% (Maximum)
 - c. Physical purity : 97% (Minimum)
 - d. Inert matter : 3% (Maximum)
3. The applicant shall also submit along with the seed a certified data on germination test made not more than one month prior to the date of submission. It also shall possess the highest genetic purity, uniformity, sanitary and phyto-sanitary standards as per national requirement.
4. The seeds/planting material shall not have been subjected to any chemical and bio-physical treatment.

III Conduct of tests:

1. The minimum duration of the DUS test shall normally be at least two independent similar growing seasons for new varieties and one season in case of farmers' varieties and varieties of common knowledge (VCK) under extant category.
2. The test shall normally be conducted at least at two test locations.
3. The field test shall be carried out under conditions favoring normal growth and expression of all test characteristics. The size of the plots shall be such that plants or its parts could be removed for measurement and observation without prejudicing the other observations on the plants until the end of growing period. Each test shall include about 360 plants across three replications. Separate plots

for observation on pest/ disease resistance for those varieties claiming resistance shall be laid out in two replications.

4. Test plot design:

- Number of rows: 04
- Row length: 3.0 m
- Row to row distance: 30cm
- Plant to plant distance: 10 cm
- No. of replication: 3

5. Observations shall not be recorded on plants in border rows.

6. Additional tests for special purpose shall be established by the PPV & FR Authority.

IV Methods and observation:

1. The characteristics described in the table of characteristics (Section VII) shall be used for the testing of varieties, parental lines and hybrids for their DUS.
2. For the assessment of Distinctness and Stability, observations shall be recorded on 30 plants or parts of 30 plants, which shall be divided among 3 replications (10 plants in each replication).
3. For the assessment of uniformity of characteristics on the plot as a whole (visual assessment by a single observation of a group of plants or parts of plants), the number of off types (including plant parts) should not exceed 2 in 100.
4. For the assessment of all colour characteristics, the latest Royal Horticultural Society (RHS) color chart shall be used.

V Grouping of varieties:

1. The candidate varieties for DUS testing shall be divided into groups to facilitate assessment of Distinctness. Characteristics which are suitable for grouping purpose are those which do not vary or vary slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.

2. The following characteristics are to be used for grouping Barnyard millet varieties

1. Plant :Pigmentation at internodes and leaf sheath (Characteristic 4)
2. Inflorescence: Shape (Characteristic 8)
3. Spikelet: Arrangement on the rachis (Characteristic 11)
4. Lower racemes: Shape (Characteristic 12)
5. Grain: Colour (Characteristic 20)

VI Characteristics & symbol

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (Section VII) shall be used.
2. Notes (1-9) shall be given for each state of expression for different characteristics for the purpose of electronic data processing.
3. Legend :

(*) Characteristics that shall be observed during every growing season on all varieties and shall always be included in the description of the variety, except when the state of expression of any of these characters is rendered impossible by a preceding phenological characteristic or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation shall be provided

(+) See Explanation on the Table of characteristics in Section VIII. It is to be noted that for certain characteristics the plant parts on which observations to be taken are given in the explanation or figure(s) for clarity and not the colour variation.

4. A decimal code number in the sixth column of Table of characteristics indicates the optimum stage for the observation of each characteristic during the growth and development of plant.

Decimal code for the growth stage

Stage code	General Description
15	Two- Four Leaf stage
26	Vegetative stage
51	50% Flowering
59	Complete flowering
67	Dough stage
83	Maturity
95	Post harvest

5. Type of assessment:

MG: Single measurement of a group of plants or parts of plants.

MS: Measurement of a number of individual plants or parts of plants.

VG: Visual assessment by a single observation of a group of plants or plant parts.

VS: Visual assessment by observation of individual plant or parts of plants.

VII Table of Characteristics

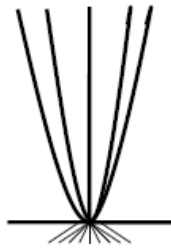
Sl no	Characteristics	States	Score/ Notes	Example Varieties	Stage of observation	Type of assessment
1 (+)	Plant: Growth habit	Erect	1	VL 207	15	VG
		Decumbent	5	VL 181		
		Prostrate	7	-		
2	Basal tillers: Number	Low (<4)	3	-	26	MS
		Medium(4-7)	5	VL 29		
		High(>7)	7	GECH 574		
3 (* (+)	Days to 50% flowering	Early(< 40)	3	PRJ 1	51	MG
		Medium (40-50)	5	RAU 11		
		Late (>50)	7	CO 2		
4 (* (+)	Plant: Pigmentation (at internodes and leaf sheath)	Absent	1	RAU 11	59	VG
		Present	9	VL 207		
5 (+)	Flag leaf blade: Length (cm)	Short (<15)	3	-	59	MS
		Medium(15.0-30.0)	5	VL 181		
		Long(30.1-45.0)	7	GECH 86		
		Very long(>45.0)	9	GECH 22		
6 (+)	Flag leaf blade: width(cm)	Narrow (<2.0)	3	GECH 3	59	MS
		Medium (2.0-3.0)	5	VL 21		
		Wide (>3.0)	7	GECH 133		
7 (+)	Peduncle: Length (cm)	Short (<10.0)	1	-	59	MS
		Medium (10.0-20.0)	3	Co 2		
		Long (>20.0)	5	GECH 217		
8 (* (+)	Inflorescence: shape	Cylindrical	3	VL 207	59	VG
		Pyramidal	5	VL 29		
		Globose- Elliptic	7	IC 404404		
9 (* (+)	Inflorescence: Colour	Green RHS NO 149 B	1	Co 2	59	VG
		Light purple RHS NO 58 B	5	IC 473117		
		Dark purple RHS NO 59 B	7	IC 404404		

10 (+)	Panicle: Compactness	Open	3	IC404446	67	VG
		Intermediate	5	VL 172		
		Compact	7	VL 29		
11 (* (+)	Spikelet: Arrangement on the rachis	Unidirectional	3	IC404449	67	VS
		Surrounded	7	VL 207		
12 (* (+)	Lower racemes: Shape	Straight	3	IC404498	67	VS
		Curved	7	VL 207		
13	Lower raceme: Thickness	Slender	3	IC404455	67	VS
		Thick	7	PRJ 1		
14 (* (+)	Lower raceme: Branching	Absent	1	VL 172	67	VS
		Present	9	GECH 6		
15	Culm: Branching	Absent	1	GECH 1	67	VG
		Present	9	VL 207		
16	Lower raceme: Length (cm)	Short(< 3)	3	GECH 2	67	MS
		Medium (3.0-5.0)	5	VL 172		
		Long (> 5.0)	7	GECH 9		
17 (* (+)	Panicle: Length (cm)	Short (<15.0)	3	GECH 570	67	MS
		Medium (15.0-25.0)	5	VL 172		
		Long (>25.0)	7	GECH 308		
18 (* (+)	Plant: Height (cm)	Dwarf (<40)	3	-	83	MS
		Semi dwarf (40.0-80.0)	5	GECH 102		
		Tall (80.1-120.0)	7	VL 21		
		Very Tall (>120.0)	9	RAU 3		
19	Seed Shattering	Absent	1	GECH 18	83	VG
		Present	9	PRJ 1		
20	Lodging	Absent	1	CO 2	83	VS
		Present	9	PRJ 1		
21 (*	Grain: Colour	Straw white RHS NO 163D	2	GECH 337	83	VG
		Light Grey RHS NO 156B	4	VL 207		
		Grey RHS NO 156A	5	PRJ 1		
22	Grain: Shape	Concave	1	VL 207	95	VG
		Oval	2	-		

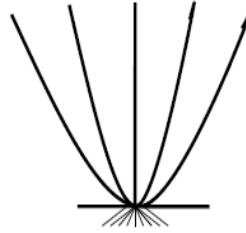
23	1000 seed weight (g) at 12% seed moisture content	Low(< 2.0)	3	-	95	MG
		Medium (2.0-3.0)	5	VL 172		
		High (3.1- 4.0)	7	VL 207		
		Very high (>4.0)	9	-		

VIII. Explanations for the Table of Characteristics

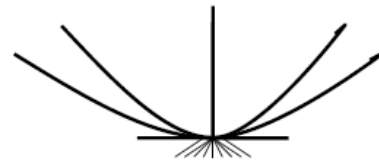
Characteristic 1 Plant: Growth habit



1
Erect



5
Decumbent



7
Prostrate

Characteristic 3 Days to 50 % flowering

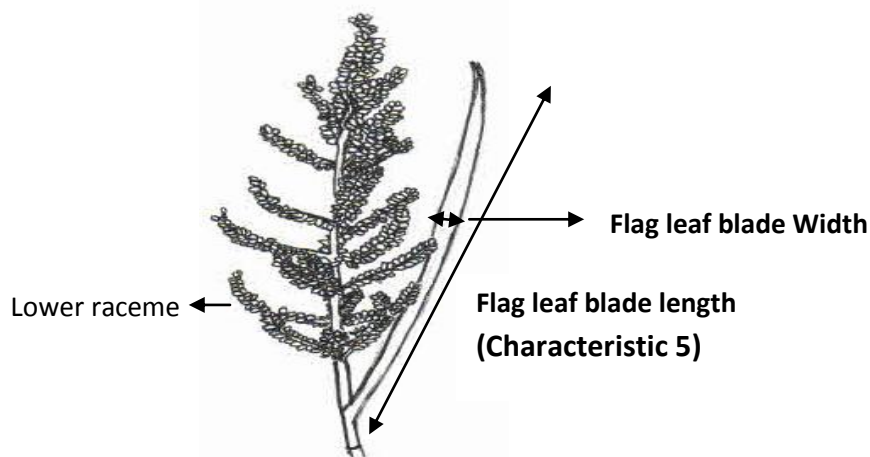
Days to 50% flowering is from sowing to the stage when ears have emerged from main tiller in 50 percent population.

Characteristic 5 Flag Leaf blade: Length (Cm)

Flag leaf blade length is measured from ligule to flag leaf blade tip.

Characteristic 6 Flag Leaf blade: Width (Cm)

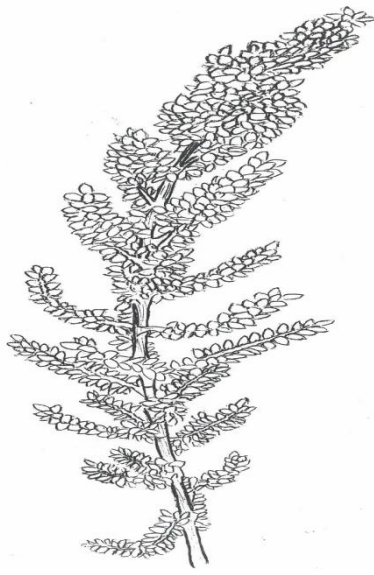
Flag leaf blade width is measured at the widest point of the flag leaf.



Characteristic 7 Peduncle: Length (Cm)

Peduncle length is measured from earhead base to the topmost node of main tiller.

Characteristic 8 Inflorescence: shape



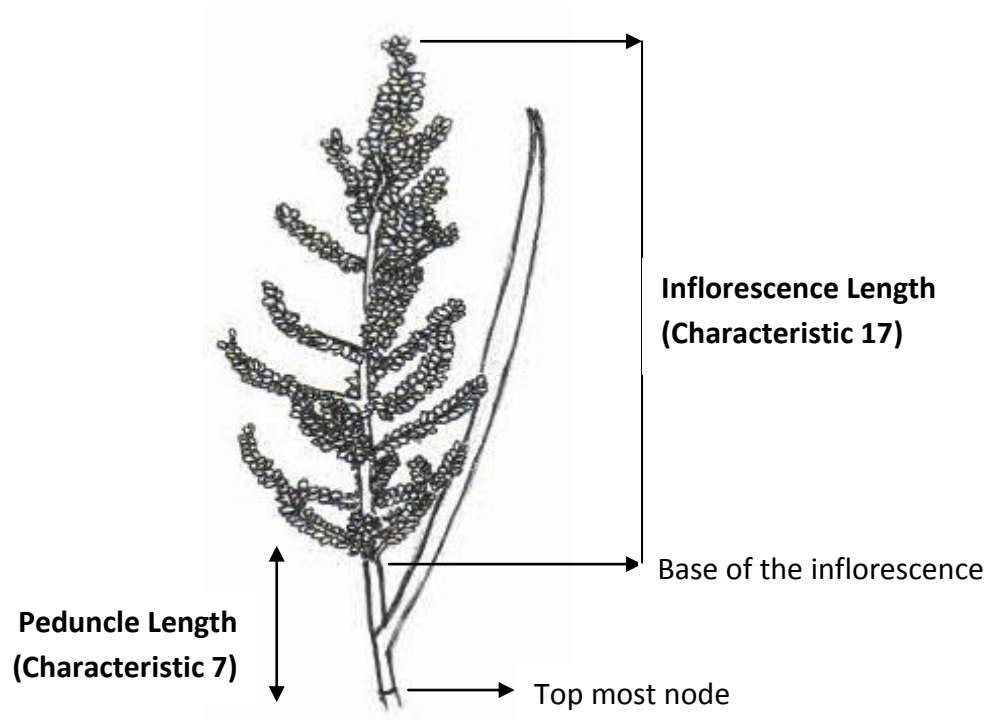
3
Cylindrical



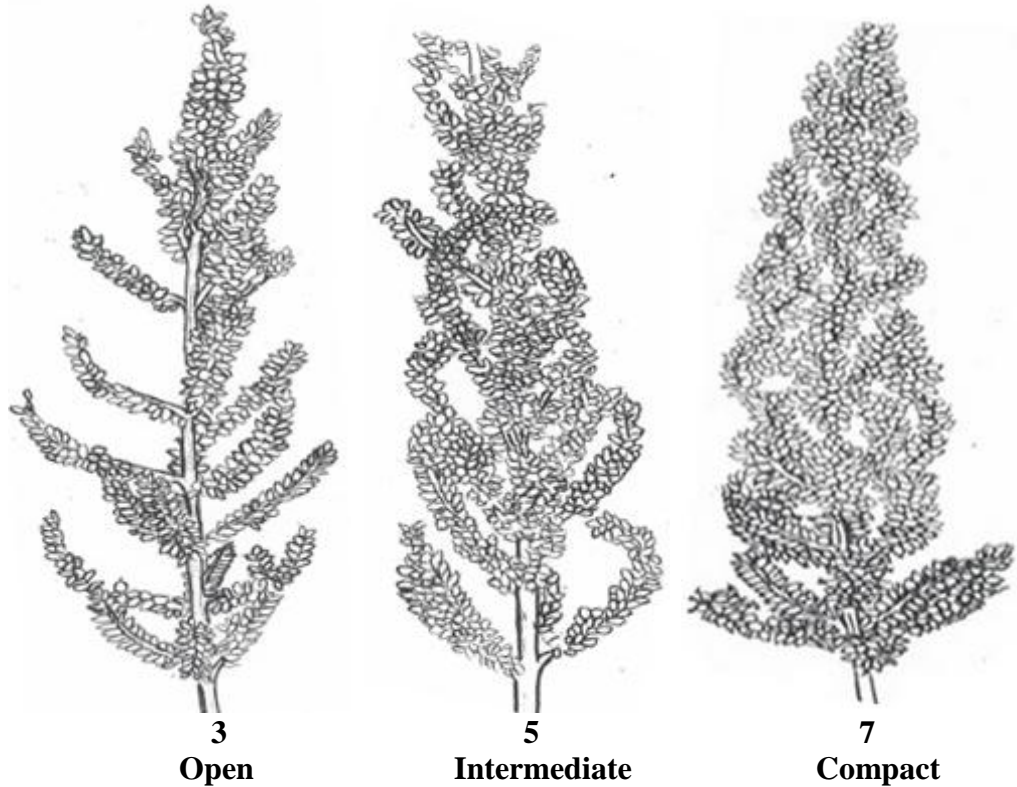
5
Pyramidal



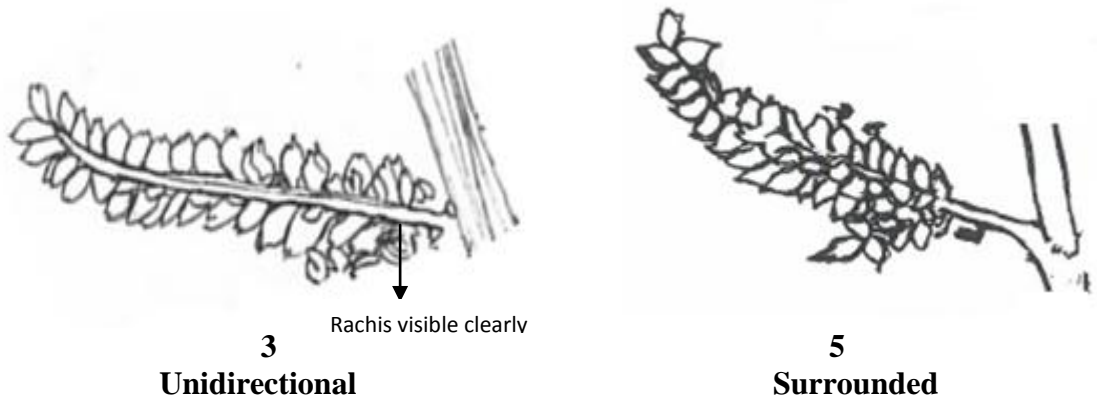
7
Globose-Elliptic



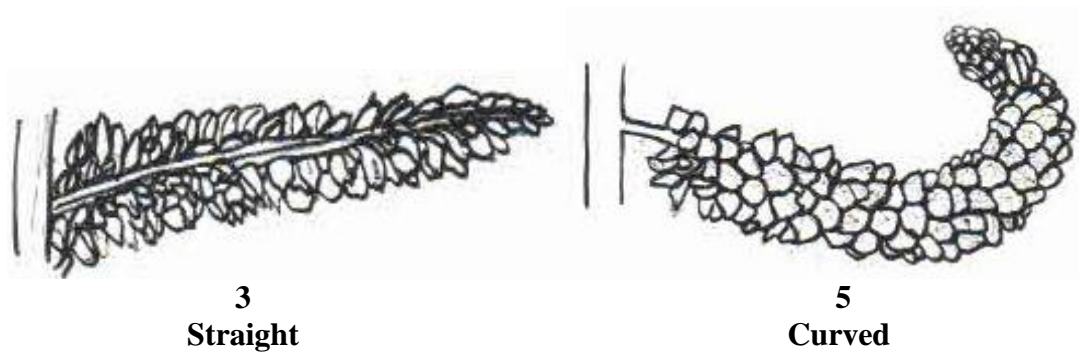
Characteristic 10 Panicle: Compactness



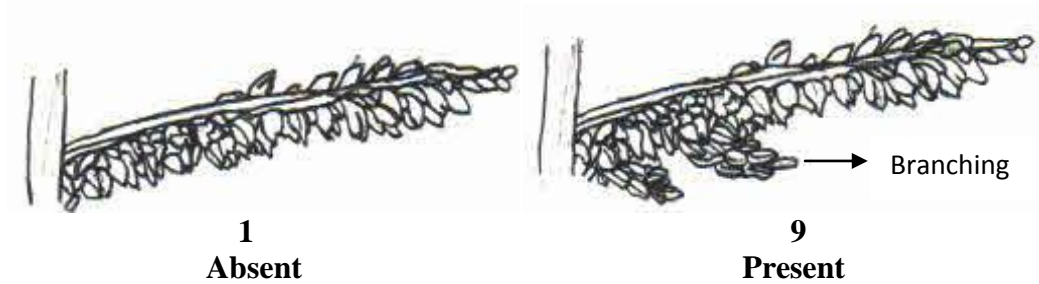
Characteristic 11 Spikelet: Arrangement on rachis



Characteristic 12 Lower raceme: Shape



Characteristic 14 Lower raceme: Branching

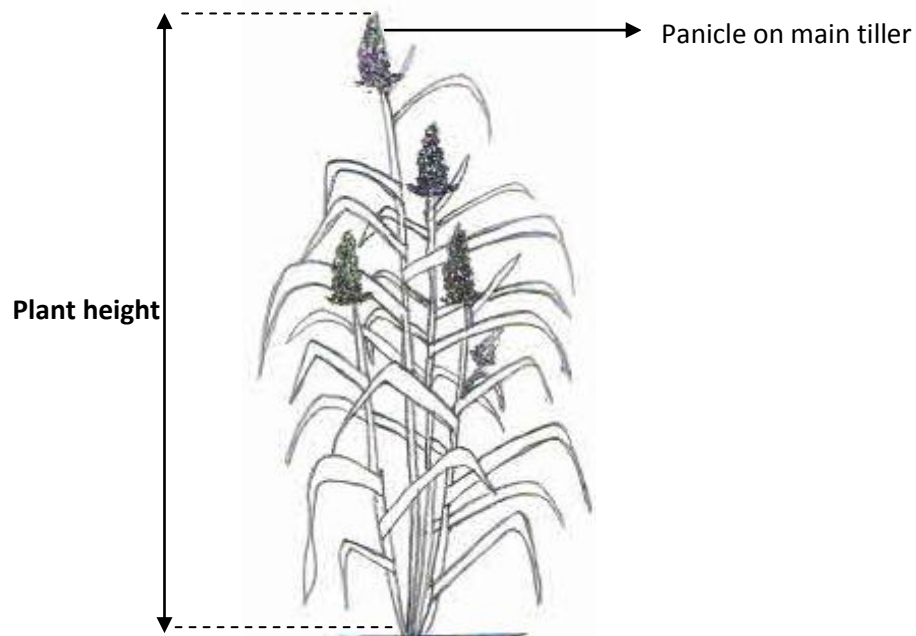


Characteristic 17 Panicle: Length (Cm)

Panicle length is measured from base of the panicle to the tip of the panicle.

Characteristic 18 Plant: Height (Cm)

Plant height is measured from ground level to the tip of the earhead of the main tiller.



IX. Working Group Details:

These Test guidelines have been developed by the National Core Committee in Consultation with the Project Coordinator, All India Coordinated Small Millets Improvement Project at UAS, GKVK, Bangalore-560 065 and the Nodal Officer, DUS Test Centre and Task Force constituted by the Authority.

The members of the Task Force

Dr. K. Narayana Gowda, Former VC UAS, Bengaluru	- Chairman
Dr. A. Seetharam, Former PC(AICPMIP), UAS, Bengaluru	- Member
Prof. B.T. Shankare Gowda, Former Prof. UAS, Bengaluru	- Member

Dr. T.G. Nagehwara Rao, PC(Small millets), UAS, Bengaluru - Member
 Dr. K.T. Krishne Gowda, Former PC(AICSMIP), UAS Bengaluru -Special Invitee
 Sh. Dipal Roy Choudhury, PPV&FRA, New Delhi -Member Secretary

Nodal Person(s) for development of the DUS Guideline

Dr. T G Nagehwara Rao, Project Co-ordinator (Small millets), UAS, GKVK
 Dr. P. Ravishankar, PC unit, Small millets UAS, GKVK
 Dr. S. Geethanjali, Jr. Breeder, TNAU, Coimbatore

X. DUS Test Centers

Nodal DUS centre	Other Test Centre(s)
All India Coordinated Research Project on Small millets, UAS, GKVK, Bangalore-560065, Karnataka	<p>South: 1. Centre of Excellence in Small millets, Athiyandal-606603, Thiruvannamalai, Tamil Nadu</p> <p>North: 1. Vivekananda Parvathiya Krishi Anusandhan Sansthan (VPKAS), Almora-263601, Uttarakhand 2. AICRP on Small millets Uttarakhand University of Hort. & Forestry, Hill Campus, Ranichauri-249199</p>