PGR Management and Use – COMPONENT I

Annual Progress Report for the year 2015-16

1. **Name of the Crop**: Ashwagandha (*Withania sommnifera* (L) Dunal)
2. **Name of the Lead Centre**: ICAR-DMAPR, Anand, Gujarat
3. Name of the Nodal person with designation: Dr. R. Nagaraja Reddy, Scientist
4. **Name of the collaborating centres**: - NIL
5. Name of Nodal person with designation: -NIL
6. **Number of accessions received from ICAR-NBPGR**: 129 accessions
7. **Number of accessions sown for characterization/multiplication**: 129 accessions
8. **Number of accessions germinated as data were recorded**: 122 accessions
9. **Experimental design**: ABD
10. **Checks used**: YES
11. **Details of the characterization**:

Sl. No.	**Name of the Centre**	**No. of accessions characterized/ multiplied**	**Date of sowing (From – to)**	**No. of descriptors***	**Date of harvesting (From – to)**	**Date of dispatch of data and seed material to NBPGR**	
						Seed	Data
1	ICAR-DMAPR, Anand, Gujarat	122	2-09-2015	22	Feb-March, 2016	6th April, 2016	6th April, 2016

*Please attach the list of descriptors/descriptor status

12. **Same descriptors were used at all the locations**: Yes
13. **Detailed report on salient achievements of characterization with details of promising lines identified for important characters**:

- One twenty nine accessions of Ashwagandha were received from the Gene bank (NBPGR), of which 122 accessions were multiplied and seeds were deposited at NBPGR, New Delhi.
- A total of 122 germplasm accessions were characterized and evaluated for 22 agro-morphological characters during the year 2015-16. The accessions showed genetic variability and were grouped based on qualitative descriptors (Table 1; Figure 1 and 2).
- Significant diversity was observed for leaf length (3.7-8.2 cm), leaf width (1.9-4.3 cm), main root length (10.0-33.5 cm), main root diameter (5.2-40.0 mm), number of secondary roots per plant (0.7-6.0), fresh root weight per plant (1.8-222.3 g), days to flower initiation (76-128), plant height (29.0-89.0 cm), days to fruit (berry) formation

(22-39), number of berries per plant (219.2-543.9), number of seeds per berry (28.0-48.0), berries diameter (4.9-6.7 mm) and days to seed harvest (178.0- 223.0) (Table 2 and Figure 3) in the accessions of Ashwagandha.

- The promising accessions for high root yield (IC0510841) and more berries (IC0553945) were identified.

Table 1. Grouping of Aswagandha accessions based on qualitative characters

S. No.	Character	No. of accessions
1	**Plant habit**	
	1 Perennial	122
	99 others	-
2	**Plant growth habit**	
	1 Erect	122
	2 Semi -erect	-
	99 Others	-
3	**Leaf shape**	
	1 Ovate	118
	2 Ovate-rounded	1
	99 others	3 (Narrowly ovate)
4	**Branching pattern**	
	1 Branched	122
	2 Profusely branched	-
5	**Leaf colour**	
	1 Greenish yellow	34
	2 Light green	55
	3 Pale green	32
	99 Others	1 (green)
6	**Root colour**	
	1 Cream	122
	2 Whitish cream	-
	99 Others	-
7	**Flower colour**	
	1 Dull yellow	102
	2 Yellow	19
	3 Green	01
	99 other	-
8	**Berry colour**	
	1 Red	5
	2 Orange	67
	99 Others	02 (creamy white), 47 (light orange)

Figure 1. Variation in the berry color in ashwagandha accessions from national Gene Bank.

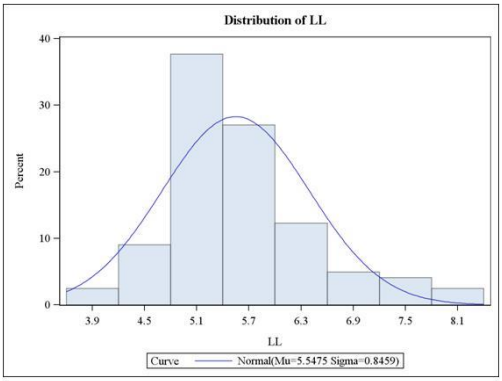
IC0283662
(Non-wavy)

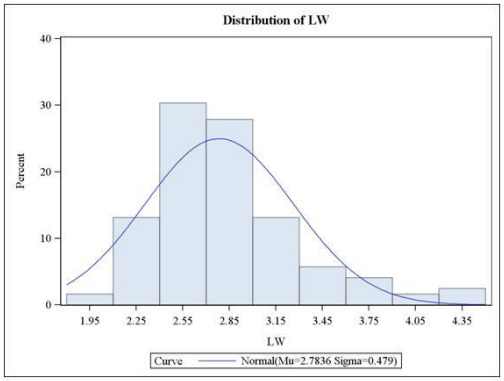
IC0604214
(Wavy)

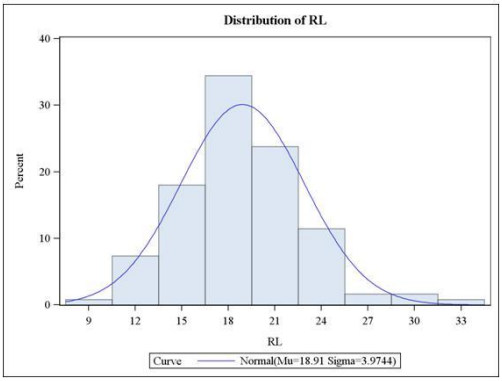
Figure 2. Variation for leaf margin in the ashwagandha accessions from national Gene Bank.

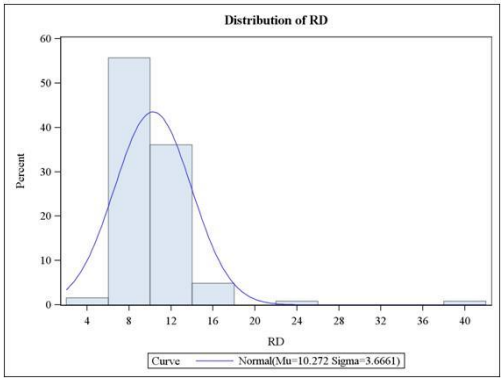
Table 2. Range and mean for various quantitative traits in ashwagandha germplasm accessions.

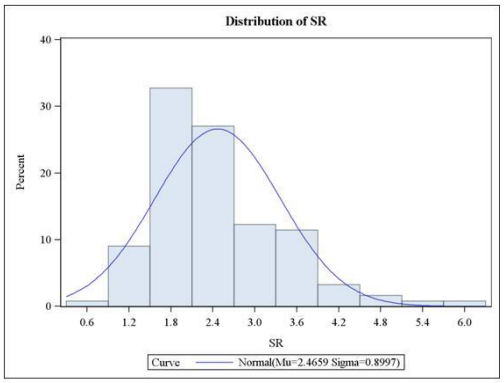
Variable	Mean	Minimum	Maximum	CV(%)
Leaf length (cm)	5.5	3.7	8.2	15.2
Leaf width (cm)	2.8	1.9	4.3	17.2
Main Root length (cm)	18.9	10.0	33.5	21.0
Main root diameter (mm)	10.3	5.2	40.0	35.7
Number of Secondary roots	2.5	0.7	6.0	36.5
Fresh root weight per plant (g)	9.9	1.8	222.3	224.4
Dry root weight per plant (g)	3.2	0.8	85.3	263.3
Days to flower initiation	91.2	76.0	128.0	10.3
Plant Height (cm)	57.0	29.0	89.0	21.0
Days to Fruit (berry) formation	30.3	22.0	39.0	13.3
Number of berries per plant	364.1	219.2	543.9	21.8
Number of seeds per berry	36.6	28.0	48.0	12.0
Berries diameter (cm)	5.8	4.9	6.7	6.5
Days to seed harvest	196.0	178.0	223.0	4.8

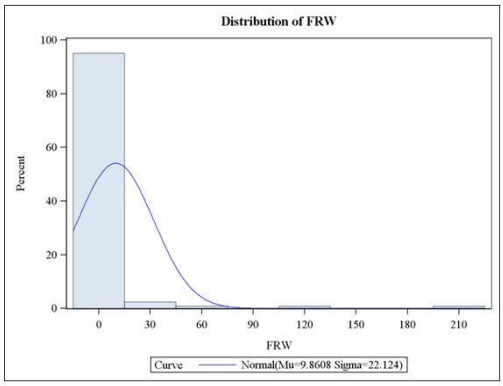

Distribution of LL
Percent
0
10
20
30
40
3.9
4.5
5.1
5.7
6.3
6.9
7.5
8.1
LL
Curve
Normal(Mu=5.5475 Sigma=0.8459)

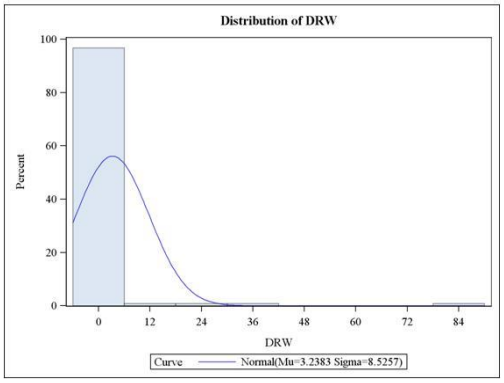

Distribution of LW
Percent
0
10
20
30
40
1.95
2.25
2.55
2.85
3.15
3.45
3.75
4.05
4.35
LW
Curve
Normal(Mu=2.7836 Sigma=0.479)

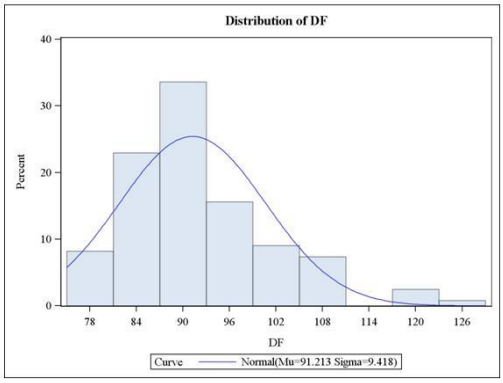

Distribution of RL
Percent
0
10
20
30
40
9
12
15
18
21
24
27
30
33
RL
Curve
Normal(Mu=18.91 Sigma=3.9744)


Distribution of RD
Percent
0
10
20
30
40
50
60
4
8
12
16
20
24
28
32
36
40
RD
Curve
Normal(Mu=10.272 Sigma=3.6661)


Distribution of SR
Percent
0
10
20
30
40
0.6
1.2
1.8
2.4
3.0
3.6
4.2
4.8
5.4
6.0
SR
Curve
Normal(Mu=2.4659 Sigma=0.8997)


Distribution of FRW
Percent
0
20
40
60
80
100
0
30
60
90
120
150
180
210
FRW
Curve
Normal(Mu=9.8608 Sigma=22.124)


Distribution of DRW
Percent
0
20
40
60
80
100
0
12
24
36
48
60
72
84
DRW
Curve
Normal(Mu=3.2383 Sigma=8.5257)


Distribution of DF
Percent
0
10
20
30
40
78
84
90
96
102
108
114
120
126
DF
Curve
Normal(Mu=91.213 Sigma=9.418)

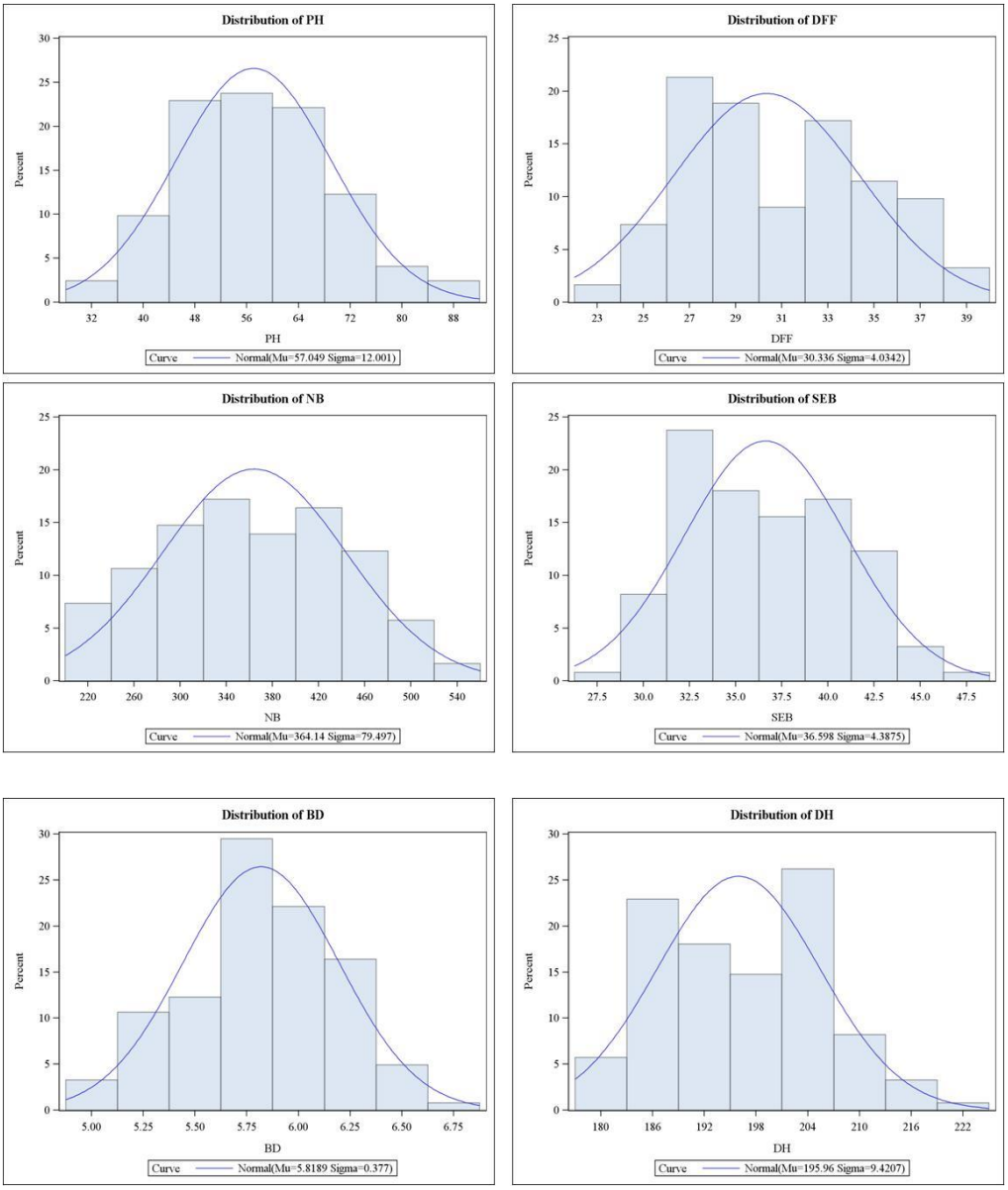


Figure 3. Distribution of various quantitative traits in Ashwagandha germplasm accessions from national Gene bank (NBPGR). (Leaf length (LL in cm), Leaf width (LW in cm), Main Root length (RL in cm), Main root diameter (RD in mm), Number of secondary roots per plant (SR), Fresh root weight per plant (RW in g), Dry root weight per plant (DRW in g), Days to flower initiation (DFF), Plant Height (PH in cm), Days to Fruit (berry) formation (DFF), Number of berries per plant (NB), Number of seeds per berry (SEB), Berries diameter (BD mm) and Days to seed harvest).

14. **Details of monitoring**:

Sl. No.	Name of the Centre	Date of monitoring	Crop stage at the time of monitoring	Monitoring team members
1	ICAR-DMAPR	28-11-2015	At time of flowering	Dr. Veena Gupta, Principal scientist, NBPGR; Dr. P. Manivel Principal scientist, DMAPR, Dr. R. N. Reddy, Scientist and Nodal person, DMAPR and Dr. Manish kumar Mittal, Scientist, DMAPR, Anand

15. **Papers Published**: -

(i) Papers published in peer reviewed journal (NAAS rating may be given) - NIL

(ii) Papers presented at scientific meetings: NIL

(iii) Manuscripts under preparation: one

1. Kundariaya V, Reddy NRR, Gupta V, Pandey S, Tyagi RK and Kumar J (2016) Characterization of Ashwagandha (*Withania sommnifera* (L.) Dunal) Germplasm Accessions Conserved at Indian National Gene Bank (Under preparation)

16. **Patents/varieties and products developed or in pipeline**: NIL

Signature:

Name: R. Nagaraja Reddy

Designation: Scientist (Plant Breeding)

Principal Investigator:

Date:

Director/Project Director/Project Coordinator