DUS Characterization of Narendra Lahar: A New High Yielding Rice Variety

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Abstract

Information regarding Novelty, distinctness, uniformity and stability are the basic mandates for the protection of varieties under Protection of Plant Varieties and Farmers' Rights Act (PPVFRA), 2001. A field experiment was conducted at Crop Research Station, Masodha Faizabad for DUS characterization of recently released high yielding rice variety Narendra Lahar as per the guidelines of International Union for the Protection of New Varieties of Plants (UPOV) during kharif 2015. DUS test results shows that Narendra Lahar is medium maturing, maturing, good tillering ability and semi tall rice variety posses. The basal leaf sheath colour is green in coloration while leaf anthocynincolration is absent in the variety. Leaf: pubescence of blade surface is very week and colorless auricles were present in the variety. Ligule was present and green in color. The grain is long slender in shape having intermediate amylase content. Molecular characterization using SSR markers also exhibits distinctness of new variety.

Keywords
Yielding, Uniformity, Novelty, Varieties.

Introduction

Rice is the staple food of more than 2/3rd population of the world and one of the largest cultivated cereal crops. It is also the major source of nutrition and livelihood of more than 120-150 million rural households of the country and backbone of agriculture based economy of India. At 104 million tons, it accounts for 34% of food grain production and 41% of cereal production at present. At current rate of population growth of 1.8% per annum, the rice requirement of the country is estimated to be around 140-160 million tonnes by 2020 (1,2,3). Achieving this target in the next few decades, without harming the environment would be a great challenge. Uttar Pradesh is the 2nd largest producer of rice in the country just after West Bengal. Eastern part of the Uttar Pradesh is the hub of rice production and rice is grown in almost all the ecologies viz. rainfed upland, well managed irrigated and rainfed lowland due highly fertile soil of Indo – Gangetic plain. The major factors affecting rice productivity in this region is low coverage by ecosystem specific varieties/hybrids, degrading soil fertility/health, erratic monsoon rainfall, shortage of labours and timely supply of other inputs. Development of new rice variety specific to prevalent ecology and agro climatic conditions is one of the options to enhanced the productivity of this region (4,5). In view of the above observation Narendra
Lahar (NDR 370135) a new high yielding rice variety was developed at Crop Research Station, Masodha for favourable irrigated ecology of Uttar Pradesh. NDR 370135 was developed from triple cross of IR 68068-99-1-3-3-3/Janak//IRRI 105. This entry was tested in Regional Agriculture Demonstration & Testing Station, Uttar Pradesh (RATDS) for consecutively three years from 20011-2014. The performance of NDR 370135 is promising in all the zones viz. central, eastern, Northern and western zones of Uttar Pradesh (6,7,8). This variety was found resistant to major location specific pests viz. Stem borer and Leaf folder and also found moderately resistant to major diseases (Blast, Sheath Blight and Bacterial Leaf Blight). The head rice recovery (HRR) of Narendra Lahar was quantified 67.80%. Agronomical evaluation of NDR 370135 indicated good fertilizer responsive trait of this rice variety. The yield capacity of this variety of irrigated medium duration is 55-60 q/ha. Performance of the NDR 370135 in On -Farm and Front Line Demonstrations was also very encouraging and it out yielded popular rice varieties of area in yield. NDR 370135 also established its yield superiority over most popular variety NDR 359 and may be good replacement for this variety as it has synchronous flowering which NDR 359 lacks. Information regarding Novelty, distinctness, uniformity and stability are basic requirement for the protection of varieties under Protection of Plant Varieties and Farmer’s Rights ACT (PPVFRA), 2001. Hence, the molecular and morphological characteristics of the Narendra Lahar (NDR 370135) were studied for DUS characterization of the variety.

**Materials and Methods**

**DUS characterization of Narendra Lahar**

The DUS characterization of the Narendra Lahar (NDR 370135) was carried out at Crop Researcha Station, Masodha, Faizabad during kharif 2015. The soil of the experimental field was sandy loam in texture with very low organic carbon (0.42%). The pH of the soil was found 7.2. Nitrogen content of the soil was 200 kg/ha, available P2O5 is 24 kg/ha and available K2O was 234 kg/ha. The experiment was laid down in randomized block design with three replications. The plot size of the experimental plots was 15 sqm and spacing of 20 cm between rows and 15 cm between plants was maintained to grow the crop. Recommended package of practices were adopted to raise the crop. Observations on agro morphological traits were recorded at different growth stages of the crop for the DUS characterization of the Variety as per the national guidelines for DUS test in rice (Table 1).

**Molecular characterization of Narendra Lahar**

**DNA isolation and PCR assays**

The genomic DNA was extracted from 10 days old rice seedlings as per Dellaporta *et al.*, (1993). PCR analysis was performed with 0.2 ilTaq DNA polymerase (5U/il) (Biotools), 1 il of genomic DNA 10 ng/il, 1 il of 10X buffer (Biotools), 0.5 il of dNTPs (2.5 mM) and 1il of each primer pair in a total volume of 10 il.

PCR was performed using thermal cycler (Applied Biosystems) following the PCR protocols reported earlier with necessary modifications. The amplified products were separated in 3% metaphor gel and visualized under phospho imager system after staining with ethidium bromide. The sizes of the amplified fragments were estimated visually using 100bp DNA ladder as size standard. Only clear and unambiguous bands of markers were scored. Band position of the prominent markers was depicted in table 2 and figure 1.
| S.No. | Characteristics                          | States                        | Note | Stage of observation | Type of assessment |
|-------|------------------------------------------|-------------------------------|------|----------------------|-------------------|
| 1     | Coleoptile: colour                       | Colourless                    | 1    | Germination          | 1                 |
|       |                                          | Green                         | 2    |                      |                   |
|       |                                          | Purple                        | 3    |                      |                   |
| 2     | Basal leaf: sheath colour                | Green                         | 1    | Vegetative growth    | 1                 |
|       |                                          | Light purple                  | 2    |                      |                   |
|       |                                          | Purple lines                  | 3    |                      |                   |
|       |                                          | Purple                        | 4    |                      |                   |
| 3     | Leaf: intensity of green colour          | Light                         | 3    | Vegetative growth    | 5                 |
|       |                                          | Medium                        | 5    |                      |                   |
|       |                                          | Dark                          | 7    |                      |                   |
| 4     | Leaf: anthocyanin colouration            | Absent                        | 1    | Vegetative growth    | 1                 |
|       |                                          | Present                       | 9    |                      |                   |
| 5     | Leaf : distribution of anthocyanin colouration | On tips only                | 1    | Vegetative growth    | 3                 |
|       |                                          | On margins only               | 2    |                      |                   |
|       |                                          | In blotches only              | 3    |                      |                   |
|       |                                          | Uniform                       | 4    |                      |                   |
| 6     | Leaf sheath: anthocyanin colouration     | Absent                        | 1    | Vegetative growth    | 1                 |
|       |                                          | Present                       | 9    |                      |                   |
| 7     | Leaf sheath : intensity of anthocyanin colouration | Very weak                  | 1    | Vegetative growth    | 1                 |
|       |                                          | Weak                          | 3    |                      |                   |
|       |                                          | Medium                        | 5    |                      |                   |
|       |                                          | Strong                        | 7    |                      |                   |
|       |                                          | Very strong                   | 9    |                      |                   |
| 8     | Leaf: pubescence of blade surface        | Absent                        | 1    | Vegetative growth    | 3                 |
|       |                                          | Weak                          | 3    |                      |                   |
|       |                                          | Medium                        | 5    |                      |                   |
|       |                                          | Strong                        | 7    |                      |                   |
|       |                                          | Very strong                   | 9    |                      |                   |
| 9     | Leaf : auricles                          | Absent                        | 1    | Vegetative growth    | 9                 |
|       |                                          | Present                       | 9    |                      |                   |
| 10    | Leaf: anthocyanin colouration of auricles| Colourless                    | 1    | Vegetative growth    | 1                 |
|       |                                          | Light purple                  | 2    |                      |                   |
|       |                                          | Purple                        | 3    |                      |                   |
| 11    | Leaf: collar                             | Absent                        | 1    | Vegetative growth    | 9                 |
|       |                                          | Present                       | 9    |                      |                   |
| 12    | Leaf: anthocyanin colouration of collar  | Absent                        | 1    | Vegetative growth    | 1                 |
|       |                                          | Present                       | 9    |                      |                   |
| 13    | Leaf: ligule                             | Absent                        | 1    | Vegetative growth    | 9                 |
|       |                                          | Present                       | 9    |                      |                   |
| 14    | Leaf: shape of ligule                    | Truncate                      | 1    | Vegetative growth    | 1                 |
|       |                                          | Acute                        | 2    |                      |                   |
|       |                                          | Split                        | 3    |                      |                   |
| 15    | Leaf: colour of ligule                   | Green                         | 1    | Vegetative growth    | 1                 |
|       |                                          | Light purple                  | 2    |                      |                   |
|       |                                          | Purple                        | 3    |                      |                   |
| 16    | Leaf: length of blade                    | Short                         | 3    | Vegetative growth    | 3                 |
|       |                                          | Medium                        | 5    |                      |                   |
|       |                                          | Long                          | 7    |                      |                   |
| 17    | Leaf: width of blade                     | Narrow                        | 3    | Vegetative growth    | 5                 |
|       |                                          | Medium                        | 5    |                      |                   |
|       |                                          | Broad                         | 7    |                      |                   |
| S.No. | Characteristics | States | Note | Stage of observation | Type of assessment |
|-------|----------------|--------|------|----------------------|-------------------|
| 18    | Culm: attitude (for floating rice only) | Non procumbent | Procumbent | 1 3 9 | Vegetative growth | 1 |
| 19 (+) | Culm: attitude | Erect | Semi-erect | Open | Spreading | 1 3 5 7 | Vegetative growth | 1 |
| 20 (*) | Time of heading (50% of plants with panicles) | Very early (<71 days) | Early (71-90 days) | Medium (91-110 days) | Late (111-130 days) | Very late (>130 days) | 1 3 5 7 9 | Vegetative growth | 5 |
| 21 (*) (+) | Flag leaf: attitude of blade (early observation) | erect | semi-erect | horizontal | deflexed | 1 3 5 7 | Vegetative growth | 1 |
| 22 (*) | Spikelet: density of pubescence of lemma | Absent | Weak | Medium | Strong | Very strong | 1 3 5 7 9 | Reproductive stage | 1 |
| 23    | Male sterility | Absent | Present | | | 1 9 | Reproductive stage | 1 |
| 24    | Lemma: anthocyanin colouration of keel | Absent or very weak | Weak | Medium | Strong | Very strong | 1 3 5 7 9 | Reproductive stage | 1 |
| 25    | Lemma: anthocyanin colouration of area below apex | Absent | Weak | Medium | Strong | Very strong | 1 3 5 7 9 | Reproductive stage | 1 |
| 26 (*) | Lemma: anthocyanin colouration of apex | Absent | Weak | Medium | Strong | Very strong | 1 3 5 7 9 | Reproductive stage | 1 |
| 27 (*) | Spikelet: colour of stigma | White | Light green | Yellow | Light purple | Purple | 1 2 3 4 5 | Reproductive stage | 1 |
| 28 (+) | Stem: thickness | Thin | Medium | Thick | | 3 5 7 | Maturity | 7 |
| 29 (*) | Stem: length (excluding panicle; excluding floating rice) | Very short (<91 cm) | Short (91-110 cm) | Medium (111-130 cm) | Long (131-150 cm) | Very long (>150 cm) | 1 3 5 7 9 | Maturity | 5 |
| 30 (*) | Stem: anthocyanin colouration of nodes | Absent | Present | | | 1 9 | Maturity | 1 |
| S.No. | Characteristics                                      | States                  | Note | Stage of observation | Type of assessment |
|-------|------------------------------------------------------|-------------------------|------|----------------------|-------------------|
| 31    | Stem : intensity of anthocyanin colouration of nodes | Weak                    | 3    | Maturity             |                   |
|       |                                                      | Medium                  | 5    |                      |                   |
| 32    | Stem: anthocyanin colouration of internodes          | Absent                  | 1    | Maturity             | 1                 |
|       |                                                      | Present                 | 9    |                      |                   |
| 33    | Panicle: length of main axis                         | Very short (<16 cm)    | 1    | Maturity             | 7                 |
|       |                                                      | Short (16-20 cm)        | 3    |                      |                   |
|       |                                                      | Medium (21-25 cm)       | 5    |                      |                   |
|       |                                                      | Long (26-30 cm)         | 7    |                      |                   |
|       |                                                      | Very long (>30 cm)      | 9    |                      |                   |
| 34    | Flag leaf: attitude of blade (late observation)      | Erect                   | 1    | Maturity             | 1                 |
|       |                                                      | Semi-erect              | 3    |                      |                   |
|       |                                                      | Horizontal              | 5    |                      |                   |
|       |                                                      | Deflexed                | 7    |                      |                   |
| 35    | Panicle: curvature of main axis                       | Straight                | 1    | Maturity             | 1                 |
|       |                                                      | Semi-straight           | 3    |                      |                   |
|       |                                                      | Drooping                | 5    |                      |                   |
|       |                                                      | Deflexed                | 7    |                      |                   |
| 36    | Panicle: number per plant                            | Few (<11)               | 3    | Maturity             | 5                 |
|       |                                                      | Medium (11-20)          | 5    |                      |                   |
|       |                                                      | Many (>20)              | 7    |                      |                   |
| 37    | Spikelet : colour of tip of lemma                    | White                   | 1    | Maturity             | 1                 |
|       |                                                      | Yellowish               | 2    |                      |                   |
|       |                                                      | Brown                   | 3    |                      |                   |
|       |                                                      | Red                     | 4    |                      |                   |
|       |                                                      | Purple                  | 5    |                      |                   |
|       |                                                      | Black                   | 6    |                      |                   |
| 38    | Lemma and Palea: colour                              | Straw                   | 1    | Maturity             | 1                 |
|       |                                                      | Gold and gold furrows on straw background | 2    |                      |                   |
|       |                                                      | Brown spots on straw    | 3    |                      |                   |
|       |                                                      | Brown furrows on straw  | 4    |                      |                   |
|       |                                                      | Brown (tawny)           | 5    |                      |                   |
|       |                                                      | Reddish to light purple | 6    |                      |                   |
|       |                                                      | Purple spots on straw   | 7    |                      |                   |
|       |                                                      | Purple furrows on straw | 8    |                      |                   |
|       |                                                      | Purple                  | 9    |                      |                   |
|       |                                                      | Black                   | 10   |                      |                   |
| 39    | Panicle : awns                                       | Absent                  | 1    | Maturity             | 1                 |
|       |                                                      | Present                 | 9    |                      |                   |
| 40    | Panicle: colour of awns (late observation)           | Yellowish white         | 1    | Maturity             |                   |
|       |                                                      | Yellowish brown         | 2    |                      |                   |
|       |                                                      | Brown                   | 3    |                      |                   |
|       |                                                      | Reddish brown           | 4    |                      |                   |
|       |                                                      | Light red               | 5    |                      |                   |
|       |                                                      | Red                     | 6    |                      |                   |
|       |                                                      | Light purple            | 7    |                      |                   |
|       |                                                      | Purple                  | 8    |                      |                   |
|       |                                                      | Black                   | 9    |                      |                   |
| 41    | Panicle: length of longest awn                       | Very short              | 1    | Maturity             |                   |
|       |                                                      | Short                   | 3    |                      |                   |
|       |                                                      | Medium                  | 5    |                      |                   |
|       |                                                      | Long                    | 7    |                      |                   |
| S.No. | Characteristics                                      | States                                           | Note | Stage of observation | Type of assessment |
|-------|-----------------------------------------------------|--------------------------------------------------|------|----------------------|-------------------|
| 42 (*)| Panicle: distribution of awns                        | Tip only<br>Upper half only<br>Whole length     | 1    | 3                    | Maturity -        |
| 43 (+) | Panicle: presence of secondary branching             | Absent<br>Present                              | 1    | 9                    | Maturity 9        |
| 44. (+)| Panicle: secondary branching                         | Weak<br>Strong<br>Clustered                     | 1    | 2                    | Maturity 1        |
| 45 (*)| Panicle: attitude of branches                        | Erect<br>Erect to semi-erect<br>Semi-erect<br>Semi-erect to spreading<br>Spreading | 1    | 3<br>5<br>7<br>9    | Maturity 3        |
| 46 (*)| Panicle: exsertion                                  | Partly exserted<br>Exserted<br>Well exserted     | 3    | 5<br>7               | Maturity 7        |
| 47    | Time of maturity                                     | Very early<br>Early<br>Medium<br>Late<br>Very late | 1    | 3<br>5<br>7<br>9     | Maturity 5        |
| 48 (+) | Leaf: senescence                                    | Early<br>Medium<br>Late                          | 3    | 5<br>7               | Maturity 5        |
| 49 (*)| Sterile lemma: colour                               | Straw<br>Gold<br>Red<br>Purple                  | 1    | 2<br>3<br>4          | Maturity 1        |
| 50    | Grain: weight of 1000 fully developed grains         | Very low<br>Low<br>Medium<br>High<br>Very high   | 1    | 3<br>5<br>7<br>9     | Maturity 5        |
| 51 (+) | Grain: length                                       | Very short<br>Short<br>Medium<br>Long<br>Very long | 1    | 3<br>5<br>7<br>9     | Maturity 7        |
| 52 (+) | Grain: width                                        | Very narrow<br>Narrow<br>Medium<br>Broad<br>Very broad | 1    | 3<br>5<br>7<br>9     | Maturity 5        |
| 53 (+) | Grain: phenol reaction of lemma                      | Absent<br>Present                               | 1    | 9                    | Maturity 1        |
| 54 (*)| Decorticated grain: length                          | Very short<br>Short<br>Medium<br>Long<br>Very long | 1    | 3<br>5<br>7<br>9     | Maturity 7        |
| S.No. | Characteristics | States | Note | Stage of observation | Type of assessment |
|-------|-----------------|--------|------|----------------------|-------------------|
| 55    | Decorticated grain: width | Narrow (<2.0 mm) Medium (2.0-2.5 mm) Broad (>2.5 mm) | 3 5 7 | Maturity | 5 |
| 56.   | Decorticated grain: shape (in lateral view) | Short slender Short bold Medium slender Long slender Long bold Extra long slender | 1 2 3 4 5 6 | Maturity | 4 |
| 57    | Decorticated grain: colour | White Light brown Variegated brown Dark brown Light red Red Variegated purple Purple Dark purple | 1 2 3 4 5 6 7 8 9 | Maturity | 1 |
| 58.   | Endosperm: presence of amylose | Absent Present | 1 9 | Maturity | 9 |
| 59    | Endosperm: content of amylose | Very low (<10%) Low(10-19%) Medium(20-25%) High(26-30%) Very high (>30%) | 1 2 3 4 5 6 | Maturity | 5 |
| 60.   | Varieties with endosperm of amylose absent only Polished grain : expression of white core | Absent or very small Small Medium Large | 1 3 5 7 | Maturity | - |
| 61    | Gelatinization temperature through alkali spreading value. | Low Medium High Medium High | 1 2 3 4 | Maturity | 3 |
| 62    | Decorticated grain: aroma | Absent Present | 1 9 | Maturity | 1 |

**Table 2** Band position of prominent markers in Narendra Lahar

| SN. | Markers | Forward Sequence | Reverse Sequence | bp |
|-----|---------|-----------------|-----------------|----|
| 1   | RM495   | AATCCAAGGTGCAGAGATGG | CAACGATGACGAACACAACC | 140 |
| 2   | RM1     | GCGAAAAACACAATGCAAAAA | GCGTTGGTTGAGACCTGAC | 110 |
| 3   | RM283   | GGCATGAGAGTCTGTGATGTG | TAGTACTCTCCATCTGCTTGG | 160 |
| 4   | RM259   | TGGAGTTTGGAGAGGAGGG | CTTGTGCCATGGTGCCATGT | 100 |
| 5   | RM312   | GTATGCTATATGGATAAGAG | AAGTCACCGATTTATCTCCTTTC | 100 |
| 6   | RM5     | TGCAACTTCTAGCTGCTCGA | GCGATCCGATCTGCTTGG | 110 |
| 7   | RM431   | GCCTGGTTGATCTCTGCTTTG | GGATGATCCACTCTCCTTGG | 260 |
| 8   | RM154   | GACGGTGAGCAGCTTATGAAACC | CGATCTGGAGAAACCCCTCTC | 170 |
| 9   | RM452   | CTGACGGAGAGCGTTAAGGG | GGGATCAAACACAGTTTCTG | 230 |
| SN. | Markers | Forward Sequence | Reverse Sequence | bp  |
|-----|---------|-----------------|-----------------|-----|
| 10  | RM489   | ACTTGAGACGATCGGACACC | TCACCCATGGATGTGGTCAG | 250 |
| 11  | OSR-13  | CATTTGTGCTACAGGAGTA | AGCCACAGCGCCCATCTCTC | 100 |
| 12  | RM338   | CACAGGAGCAGGAAGAGC | GGCAAACCGATCAGTGCAC | 200 |
| 13  | RM55    | CCGTCGCCGCTAGTGGAGAAG | TCCCGGTATTATTAAGGCG | 250 |
| 14  | RM514   | AGATTGATCTCAGGAGTGG | CATGCTAGCATGAACTGCTC | 150 |
| 15  | RM307   | ATCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 300 |
| 16  | RM124   | ATCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 300 |
| 17  | RM118   | CCAATCGGAGCCACCGGAGAC | CACATCCTCCACCGACGCCA | 150 |
| 18  | RM455   | CCACAAATTAATCCGGATCACACC | ATAGCAGCATGGAACGAGCC | 110 |
| 19  | RM161   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 150 |
| 20  | RM474   | CAGATGAGAAGCGGCGCCT | TGCTAGATGGAGATCAGTGGTCG | 110 |
| 21  | RM536   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 120 |
| 22  | RM484   | CCAATCCGACATTGACGAGC | ATAGCAGCATGGAACGAGCC | 110 |
| 23  | RM552   | CACAGGAGCAGGAAGAGC | GGCAAACCGATCAGTGCAC | 200 |
| 24  | RM536   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 120 |
| 25  | RM287   | CTAGATCTACAATTCCATCC | TGGCTAGATGGAGATCAGTGGTCG | 110 |
| 26  | RM105   | GTGCTGACACCATCGGACCGAC | ATAGCAGCATGGAACGAGCC | 110 |
| 27  | RM484   | CCAATCCGACATTGACGAGC | ATAGCAGCATGGAACGAGCC | 110 |
| 28  | RM552   | CACAGGAGCAGGAAGAGC | GGCAAACCGATCAGTGCAC | 200 |
| 29  | RM536   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 120 |
| 30  | RM287   | CTAGATCTACAATTCCATCC | TGGCTAGATGGAGATCAGTGGTCG | 110 |
| 31  | RM105   | GTGCTGACACCATCGGACCGAC | ATAGCAGCATGGAACGAGCC | 110 |
| 32  | RM484   | CCAATCCGACATTGACGAGC | ATAGCAGCATGGAACGAGCC | 110 |
| 33  | RM552   | CACAGGAGCAGGAAGAGC | GGCAAACCGATCAGTGCAC | 200 |
| 34  | RM536   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 120 |
| 35  | RM287   | CTAGATCTACAATTCCATCC | TGGCTAGATGGAGATCAGTGGTCG | 110 |
| 36  | RM105   | GTGCTGACACCATCGGACCGAC | ATAGCAGCATGGAACGAGCC | 110 |
| 37  | RM484   | CCAATCCGACATTGACGAGC | ATAGCAGCATGGAACGAGCC | 110 |
| 38  | RM552   | CACAGGAGCAGGAAGAGC | GGCAAACCGATCAGTGCAC | 200 |
| 39  | RM536   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 120 |
| 40  | RM287   | CTAGATCTACAATTCCATCC | TGGCTAGATGGAGATCAGTGGTCG | 110 |
| 41  | RM105   | GTGCTGACACCATCGGACCGAC | ATAGCAGCATGGAACGAGCC | 110 |
| 42  | RM484   | CCAATCCGACATTGACGAGC | ATAGCAGCATGGAACGAGCC | 110 |
| 43  | RM552   | CACAGGAGCAGGAAGAGC | GGCAAACCGATCAGTGCAC | 200 |
| 44  | RM536   | TCGTCTGGTGGCAGTGGTCG | CATGGATACAGGCAGCAGAGCT | 120 |
| 45  | RM287   | CTAGATCTACAATTCCATCC | TGGCTAGATGGAGATCAGTGGTCG | 110 |
| 46  | RM105   | GTGCTGACACCATCGGACCGAC | ATAGCAGCATGGAACGAGCC | 110 |
| 47  | RM19    | CAAAACAGAGCAGAGATGAC | CTCAAGATGGAGACCCAGA | 260 |
| 48  | RM277   | CGGCTAAAATCATACGCTGAG | CAAAGCTTGGCAAEGGAG | 140 |
Results and Discussion

The data depicted in table 1 exhibit that Narendra Lahar posse’s distinct, unique and stable morphological trait which differ it from the other high yielding varieties of irrigated ecosystem and land races. DUS test evaluation revealed that Narendra Lahar is medium maturing, maturing, good tillering ability and semi tall rice variety. The basal leaf sheath colour is green in coloration while leaf: anthocyninoloration is absent in the variety. Leaf: pubescence of blade surface is very week and colorless auricles were present in the variety. Ligule was present and green in color. The anthocynin coloration of nodes and internodes is absent. It possesses aweless and well exerted panicle. The length of the panicle is medium. The 1000 grain weight of Narendra Lahar is medium and shape of grain is long slender.. It possesses good cooking quality with moderate amylose content 21.56% having soft gel (Gel consistency - 46 mm). Cooked rice of Narendra Lahar is non sticky rice varieties are preferred by the Indian consumers. Gelatinization temperature of the variety was also reported on the basis of alkali spreading value and it was found medium. The band position of prominent SSR markers depicted in table 2 and figure 1 also exhibits distinct and uniqueness of this variety. These SSR markers were used by Shakil et al., (2015) for molecular characterization of modern high yielding rice varieties of Bangladesh. The present study of molecular and morphological characterization of Narendra Lahar will be helpful in the identification of variety and to maintain its genetic purity. This information will be very useful for the persons involved in seed certification and seed production programme.

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