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# VL *Dhan* 88 a newly notified rice variety for cultivation under lower and medium elevation of Northern hills

## JP Aditya, Anuradha Bhartiya, PK Agrawal, Rajashekara H, VS Meena, L Kant, JK Arya and Devendra Lal

**Abstract**
VL *Dhan* 88 is an early duration rice variety suitable for cultivation under lower hills of Himachal Pradesh, Meghalaya and medium hills of Uttarakhand, Himachal Pradesh. This was released by the Central Sub-Committee on Crop Standards Notification and Release of Variety for Agricultural Crops and notified by the Central Seed Committee vide notification number S.O.500(E) dated the 29th January, 2021. This variety was developed by ICAR-*Vivekananda Parvatiya Krishi Anusandhan Sansthan* (VPKAS) Almora, Uttarakhand under irrigated early duration segment after 13 years. This was found promising, exhibited stability and shown significant superiority over the checks. This is derived from the cross *Vivek Dhan* 82/VL 31629. This has provided grain yield of 4,963 kg/ha in lower hills and 4,332 kg/ha under medium elevation and found significantly superior to VL *Dhan* 86 (national check), Shalimar Rice 3 (regional check) and local check. VL *Dhan* 88 has been consistent performer in lower elevated hills of Himachal Pradesh & Meghalaya and medium elevated hills of Uttarakhand & Himachal Pradesh during the four years of testing and found promising for these regions. It has shown moderate resistance against leaf blast, neck blast, sheath blight and bacterial leaf blight. This variety has recorded 77.5% hulling, 68.4% milling, 54.2% head rice recovery, 22.47% amylose content and intermediate ASV (4.0). VL *Dhan* 88 has long bold grain, kernel length (6.10mm), kernel breadth (2.21mm), L/B ratio (2.76).

**Keywords:** VL *Dhan* 88, early duration, irrigated transplanted, hill rice, low and medium elevation, high yielding variety

## Introduction
Rice is a major food crop of Northern Himalayan hill regions. Northern Hill Zone constitutes North Western Hills (Uttarakhand, H.P and J&K) and North Eastern Hills (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizorum, Nagaland, Sikkim and Tripura). As per the data available on DES, MOA&FW, GOI, rice is grown in both kharif and rabi season in Uttarakhand of NW Hills and all states of NE Hills except Sikkim. It is grown in an area of about 3.94 m ha with production of 9.04 mt and productivity 2,293 kg/ha. The area (3.35 m ha) and production (7.60 mt) of rice are highest in North-East Himalayan hills compared to the North-Western Himalayan hills whereas, productivity (2,435 kg/ha) is highest in N-W Himalayan hills (DES 2022, GOI).

Hill ecology has different elevations which have been mainly categorized into three i.e., low hills (≤950m amsl), medium hills (951-1500m amsl) and high hills (≥1501m amsl) (ICAR-IIRR, Hyderabad, 2022) [3]. Each elevation has its own pros and cons and has different cropping patterns. Both irrigated and rainfed upland rice are grown in the majority of the hilly region. Irrigated rice is mainly grown in the valleys where irrigation facility is available else rainfed rice is common at places which fully depend upon the rainfall. Early(100-120 days) and medium(121-140 days) maturity rice varieties are preferred among the hill farmers under irrigated ecosystem depending upon the community farming of the particular hill region and accordingly varieties of a specific duration are being grown by the farmers or get its place in particular region (Aditya *et al.* 2018) [1]. Therefore, development of duration and elevation specific varieties plays vital role in irrigated hill ecology. Considering this point in mind, efforts have been concentrated towards the development of high yielding, early & medium maturity rice varieties for irrigated hill ecosystem and after a long waiting period of 13 years, VL *Dhan* 88 has been developed at ICAR-*Vivekananda Parvatiya Krishi Anusandhan Sansthan* (VPKAS), Almora in irrigated early duration segment.

The newly notified variety, VL *Dhan* 88 is suitable for cultivation under lower hills of Himachal Pradesh, Meghalaya and medium hills of Uttarakhand, Himachal Pradesh. This variety has been recently released and notified by the Central Sub-Committee on Crop Standards Notification and Release of Variety (CSC ON CSN&RV) for Agricultural Crops, New Delhi vide notification number S.O.500(E) dated the 29th January, 2021. This variety has been found promising, exhibited stability and shown significant superiority over the checks and cultivation of this variety will help in yield stabilization, varietal diversification and fulfill the requirement of irrigated rice growers of hill farmers.

**Materials and Methods**
The crosses were made between *Vivek Dhan* 82 and VL 31629 in 2010 at ICAR-*Vivekananda Parvatiya Krishi Anusandhan Sansthan* Almora, Uttarakhand. 40 $F_1$ seeds were grown in 2011 and all desirable plants were bulked. 10 rows of $F_2$ generation seed were grown in 2011-12 off-season nursery at NRRI, Cuttack and desirable plants bearing high yield, disease resistance and non-lodging traits were selected in $F_2$ and advanced further to $F_3$. Each $F_3$ ears were grown in 2 rows in 2012 and Ear to row method was followed for generation advancement up to $F_5$ generation. Four progenies of this cross were evaluated in observational nursery in 2013 and the best progeny row number 1 namely VR 3371-1 was found significantly superior to the best check were bulked for further evaluation in station trial. This was named as VL 32224 in station trial and tested for two years during 2014 and 2015 for grain yield and disease resistance. Based on its superior performance in station trial over the best check, it was nominated as entry in the Initial Varietal Trials (IVT) of All India Coordinated Rice Improvement Programme (AICRIP) in 2016 in Hill Zone (Zone I). This entry was evaluated under multilocation irrigated transplanted medium duration hill trials for four years (2016-2019) at different AICRP hill centres for grain yield and other important traits. The detailed flow chat of pedigree, breeding programme and evaluation of VL *Dhan* 88 are shown in the Figure1. The experiment was conducted in randomized complete block design (RCBD) in three replication and observations were recorded in each replication for grain yield, days to 50% flowering, days to maturity, plant height (cm), panicle length (cm) and panicle per meter square. The entry, VL 32224 was found significantly superior over the checks under AICRIP trials (IVT, AVT1 & AVT2), therefore, identified for release as a variety by the Variety Identification Committee (VIC) in the rice workshop meeting. Agronomical performance of this entry was tested at four different centers in 2018. The reaction against major diseases and insect pests were also studied in various hot spot centers for four years (2016-2019). The different grain quality parameters were also analyzed for three years (2017 and 2019) at ICAR- Indian Institute of Rice Research, Hyderabad. Finally, this was released and notified by the Central Sub-Committee on Crop Standards Notification and Release of Variety for Agricultural Crops vide notification number S.O.500 (E) dated the 29th January, 2021.

**Results and Discussion**
In AICRIP trials on an average of four years (2016-2019), VL *Dhan* 88 has recorded a overall mean grain yield of 4,963 kg/ha in lower hills as compare to national check, VL *Dhan* 86 (4,471 kg/ha); regional check, Shalimar Rice 3 (4,065 kg/ha) & Local check (4,365 kg/ha) with yield advantage of 11.01, 22.10 and 13.71 per cent, respectively over these checks (Table1), however, under medium elevation it yielded 4,332 kg/ha which was superior to VL *Dhan* 86 (national check) by 15.93%, Shalimar Rice 3 (regional check) by 97.07% and local check by 33.03% (Table2). The performance of VL *Dhan* 88 in agronomic trial data is presented in Table 3 and this variety was found responsive at both lower and normal fertility level though grain yield level was not found higher than the check varieties. The disease reaction of VL *Dhan* 88 has been recorded under natural and artificial condition at different hot spot locations and it was observed that this variety is moderately resistance against leaf blast, neck blast, sheath blight and bacterial leaf blight (Table4). Data of insect pests *viz.*, brown plant hopper, white backed plant hopper, stem borer and leaf folder have also been recorded at different locations under natural and artificial condition (Table 5) and this variety has shown tolerance against these insect pests.

The grain quality characteristics of this variety has been found very good and acceptable *viz.*, hulling 77.5%, milling 68.4%, head rice recovery 54.2%, kernel length 6.10mm, kernel breadth 2.21mm, L/B ratio 2.76mm. It has long bold grain and exhibited intermediate alkali spread value (4.0) and amylose (22.47%) content (Table 6). The overall mean of days to fifty per cent flowering ranged between 93-94 days, plant height 111-123 cm and panicles per meter square 259-279 in lower hills and medium hills. It possesses semi-erect, intermediate and non-lodging plant type; awnless, semi-erect and well exerted panicle; Basal Leaf Sheath colour is green, Pubescence is absent on leaf blade surface and flag leaf is erect in early stage & semi-erect in later stage (Table 7). Wide spread of this variety will enhance its adoption among the farmers and would help in yield stabilization, varietal diversification and fulfil the requirement of irrigated rice growers of hill farmers.

**Table 1:** Grain yield (kg/ha) data of Coordinated Variety Trials in Northern Lower Hills (HP, ME)

| | Year of testing | No. of trials | Released variety VL *Dhan* 88 | Check Var.1 VL *Dhan* 86 (NC) | Check Var.2 Shalimar Rice 3 (RC) | Check Var.3 (LC) | Qual. Var.1 IET 25818 | Qual. Var.2 IET 25826 | C.D. |
|---|---|---|---|---|---|---|---|---|---|
| Mean yield (kg/ha) | I Year (2016) | 2 | 5073 | 4576 | 3735 | 4610 | 5130 | 4465 | 693 |
| | II Year (2017) | 3 | 4554 | 3799 | 4162 | 3773 | 4477 | 5034 | 370-709 |
| | III Year (2018) | 2 | 3949 | 3768 | 3405 | 3927 | 3365 | 4013 | 535-842 |
| | IV Year (2019) | 2 | 6482 | 6078 | 4909 | 5446 | - | 5876 | 350 |
| Weighted Mean | | | 4963 | 4471 | 4065 | 4365 | 4346 | 4868 | |
| Percentage increase or decrease over the checks & qualifying varieties | I Year (2016) | | | (+) 10.86 | (+) 35.82 | (+) 10.04 | (-) 1.11 | (+) 13.62 | |
| | II Year (2017) | | | (+) 19.87 | (+) 9.42 | (+) 20.70 | (+) 1.72 | (-) 9.54 | |
| | III Year (2018) | | | (+) 4.80 | (+) 15.98 | (+) 0.56 | (+) 17.36 | (-) 1.59 | |
| | IV Year (2019) | | | (+) 6.65 | (+) 32.04 | (+) 19.02 | - | (+) 10.31 | |
| Mean percentage increase | | | | (+) 11.01 | (+) 22.10 | (+) 13.71 | (+) 14.21 | (+) 1.96 | |
| Frequency in the top group (pooled for 4 years) | | | 5/9 | 5/9 | 0/9 | 3/9 | 2/9 | 6/9 | |

**Table 2:** Grain yield (kg/ha) data of coordinated variety trials in northern medium Hills (HP, UT)

| | Year of testing | No. of trials | Released variety VL *Dhan* 88 | Check Var.1 VL *Dhan* 86 (NC) | Check Var.2 Shalimar Rice 3 (RC) | Check Var.3 (LC) | Qual. Var.1 IET 25818 | Qual. Var.2 IET 25826 | C.D. |
|---|---|---|---|---|---|---|---|---|---|
| Mean yield (kg/ha) | I Year (2016) | 2 | 3762 | 4167 | 3131 | 2992 | 3500 | 5143 | 253 |
| | II Year (2017) | 3 | 4445 | 3931 | 2430 | 3048 | 3678 | 3202 | 557-1062 |
| | III Year (2018) | 2 | 4206 | 3106 | 1100 | 3094 | 3028 | 4483 | 380-486 |
| | IV Year (2019) | 2 | 4859 | 3646 | 2016 | 3996 | - | 4457 | 584 |
| Weighted Mean | | | 4332 | 3737 | 2198 | 3256 | 3441 | 4197 | |
| Percentage increase or decrease over the checks & qualifying varieties | I Year (2016) | | | (-) 9.72 | (+) 20.15 | (+) 25.74 | (+) 7.49 | (-) 26.85 | |
| | II Year (2017) | | | (+) 13.08 | (+) 82.92 | (+) 45.83 | (+) 20.85 | (+) 38.82 | |
| | III Year (2018) | | | (+) 35.42 | (+) 282.36 | (+) 35.94 | (+) 38.90 | (-) 6.18 | |
| | IV Year (2019) | | | (+) 33.27 | (+) 141.02 | (+) 21.60 | - | (+) 9.02 | |
| Mean percentage increase | | | | (+) 15.93 | (+) 97.07 | (+) 33.03 | (+) 25.88 | (+) 3.22 | |
| Frequency in the top group (pooled for 4 years) | | | 4/9 | 2/9 | 0/9 | 1/9 | 1/9 | 4/9 | |

**Table 3:** Adaptability to changes in agronomic conditions

| Experiment | Year of testing | No. of trials | Item | Released variety VL *Dhan* 88 | Check Var.1 VL *Dhan* 86 (NC) | Check Var.2 Shalimar Rice 3 (RC) | Check Var.3 (LC) |
|---|---|---|---|---|---|---|---|
| | | | | Grain yield (t/ha) | | | |
| Fertilizer Experiment response to NPK | 2018 | 4 | F1: 50% RDF | 3.04 | 3.9 | 3.55 | 3.38 |
| | | | F2: 100% RDF | 3.95 | 4.72 | 4.22 | 4.2 |
| | | | Mean | 3.50 | 4.31 | 3.89 | 3.79 |

**Table 4:** Reaction to major diseases in Northern Low (HP, ME) & Medium Hills (HP, UT)

| Parameter | Year of testing | No. of Location | Released variety VL *Dhan* 88 | Check Var.1 VL *Dhan* 86 (NC) | Check Var.2 Shalimar Rice 3 (RC) | Qual. Var.1 IET 25818 | Qual. Var.2 IET 25826 |
|---|---|---|---|---|---|---|---|
| Leaf Blast (SI) | I Year (2016) | 8 | 4.9 | 4.6 | 5.1 | 5.4 | 4.1 |
| | II Year (2017) | 8 | 6.3 | 5.8 | 6.1 | 6.5 | 5.4 |
| | III Year (2018) | 10 | 5.3 | 5.6 | 5.5 | 5.8 | 4.6 |
| | IV Year (2019) | 9 | 5.9 | 6.6 | 6.2 | NA | 5.6 |
| | Mean | | 5.6 | 5.7 | 5.7 | 5.9 | 4.9 |
| Neck Blast (SI) | I Year (2016) | 5 | 5.8 | 5.8 | 7.0 | 5.8 | 3.5 |
| | II Year (2017) | 9 | 5.4 | 5.0 | 5.0 | 6.2 | 5.0 |
| | III Year (2018) | 9 | 5.0 | 5.0 | 5.8 | 5.0 | 3.4 |
| | IV Year (2019) | 4 | 4.0 | 5.5 | 6.0 | NA | 5.0 |
| | Mean | | 5.1 | 5.3 | 6.0 | 5.7 | 4.2 |
| Sheath Blight (SI) | I Year (2016) | 2 | 5.0 | 6.0 | 5.0 | 6.0 | 5.0 |
| | II Year (2017) | 3 | 4.0 | 6.0 | 6.0 | 5.0 | 5.0 |
| | III Year (2018) | 4 | 7.0 | 7.0 | 7.0 | 7.5 | 6.0 |
| | IV Year (2019) | 3 | 5.7 | 7.0 | 7.0 | NA | 5.0 |
| | Mean | | 5.4 | 6.5 | 6.0 | 6.2 | 5.3 |
| BLB (SI) | I Year (2016) | 5 | 6.2 | 6.6 | 7.4 | 5.8 | 5.0 |
| | II Year (2017) | 4 | 5.5 | 7.0 | 7.0 | 8.0 | 5.0 |
| | III Year (2018) | 4 | 6.0 | 7.0 | 6.0 | 5.5 | 6.0 |
| | IV Year (2019) | 4 | 7.5 | 7.5 | 8.0 | NA | 7.5 |
| | Mean | | 6.3 | 7.0 | 7.1 | 6.4 | 5.9 |

**Table 5:** Reaction to major insect pests in Northern Low (HP, ME) & Medium Hills (HP, UT)

| Parameter | Year of testing | No. of Location | Released variety VL *Dhan* 88 | Check Var.1 VL *Dhan* 86 (NC) | Check Var.2 Shalimar Rice 3 (RC) | Qual. Var.1 IET 25818 | Qual. Var.2 IET 25826 |
|---|---|---|---|---|---|---|---|
| BPH (GR, DS) | I Year (2016) | 3 | 8.8 | 8.7 | 8.9 | 8.0 | 6.9 |
| | II Year (2017) | 4 | 7.4 | 8.2 | 8.3 | 8.3 | 6.6 |
| | III Year (2018) | 4 | 7.4 | 7.1 | 7.9 | 7.0 | 7.7 |
| | IV Year (2019) | 2 | 7.3 | 7.3 | 7.8 | NA | 7.0 |
| | Mean | | 7.7 | 7.8 | 8.2 | 7.8 | 7.0 |
| WBPH (GR, DS) | I Year (2016) | 1 | 6.8 | 6.4 | 8.1 | 7.8 | 9 |
| | II Year (2017) | 2 | 8.5 | 8.9 | 8.9 | 8.7 | 6.7 |
| | III Year (2018) | 2 | 8.4 | 6.7 | 8.5 | 8.3 | 6.6 |
| | IV Year (2019) | 1 | 9.0 | 9.0 | 9.0 | NA | 9.0 |
| | Mean | | 8.2 | 7.7 | 8.6 | 8.3 | 7.8 |
| Stem Borer White Ear (% WE) | I Year (2016) | 2 | 6.0 | 6.1 | 7.1 | 4.2 | 12.2 |
| | II Year (2017) | 2 | 6.6 | 7.7 | 3.2 | 8.2 | 8.5 |
| | III Year (2018) | 1 | 14.3 | 11.8 | 21.9 | 11.9 | 14.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | IV Year (2019) | 2 | 7.5 | 14.4 | 8.7 | NA | 15.3 |
| | Mean | | 8.9 | 8.5 | 10.7 | 8.1 | 11.7 |
| Leaf folder (% DL) | I Year (2016) | 1 | 11.2 | 15.1 | 8.4 | 10 | 4.6 |
| | II Year (2017) | 0 | NA | NA | NA | NA | NA |
| | III Year (2018) | 2 | 15.9 | 15.1 | 12.7 | 16.0 | 15.7 |
| | IV Year (2019) | 1 | 24.5 | 28.0 | 30.2 | NA | 29.2 |
| | Mean | | 17.2 | 19.4 | 17.1 | 13.0 | 16.5 |

**Table 6:** Data on Quality Characteristics of the variety VL *Dhan* 88

| Grain quality characteristics | Year | Released variety VL *Dhan* 88 | Check Var.1 VL *Dhan* 86 (NC) | Check Var.2 Shalimar Rice 3 (RC) | Check Var.3 (LC) | Qual. Var.1 IET 25818 | Qual. Var.2 IET 25826 |
|---|---|---|---|---|---|---|---|
| Hulling (%) | 2017 | 77.6 | 81.4 | 78.8 | 77.2 | 81.8 | 78 |
| | 2018 | 78.9 | 78.9 | NA | 79.9 | 80.0 | 80.2 |
| | 2019 | 76.1 | 78.6 | 77.8 | NA | NA | 76.3 |
| | Mean | 77.5 | 79.6 | 78.3 | 78.6 | 80.9 | 78.2 |
| Milling (%) | 2017 | 68.6 | 71.5 | 67.6 | 61.1 | 70.7 | 68.1 |
| | 2018 | 66.8 | 63.6 | NA | 69.6 | 70.4 | 71.6 |
| | 2019 | 69.9 | 69.3 | 70.1 | NA | NA | 66.8 |
| | Mean | 68.4 | 68.1 | 68.9 | 65.4 | 70.6 | 68.8 |
| Head Rice Recovery (%) | 2017 | 67.5 | 63.8 | 66.3 | 17.3 | 69.6 | 65.5 |
| | 2018 | 33.8 | 29.4 | NA | 37.4 | 66.0 | 60.9 |
| | 2019 | 61.2 | 50.5 | 68.1 | NA | NA | 51.9 |
| | Mean | 54.2 | 47.9 | 67.2 | 27.4 | 67.8 | 59.4 |
| Kernel length(mm) | 2017 | 5.62 | 5.49 | 5.34 | 5.72 | 5.74 | 6.52 |
| | 2018 | 6.37 | 5.33 | NA | 5.81 | 5.61 | 6.98 |
| | 2019 | 6.31 | 5.62 | 5.6 | NA | NA | 6.33 |
| | Mean | 6.10 | 5.48 | 5.47 | 5.77 | 5.68 | 6.61 |
| Kernel breadth (mm) | 2017 | 2.3 | 2.45 | 2.43 | 2.3 | 2.45 | 2.09 |
| | 2018 | 2.22 | 2.56 | NA | 2.45 | 2.45 | 2.18 |
| | 2019 | 2.12 | 2.55 | 2.42 | NA | NA | 1.93 |
| | Mean | 2.21 | 2.52 | 2.43 | 2.38 | 2.45 | 2.07 |
| L/B ratio | 2017 | 2.44 | 2.24 | 2.19 | 2.48 | 2.34 | 3.11 |
| | 2018 | 2.86 | 2.08 | NA | 2.37 | 2.28 | 3.2 |
| | 2019 | 2.97 | 2.2 | 2.31 | NA | NA | 3.27 |
| | Mean | 2.76 | 2.17 | 2.25 | 2.43 | 2.31 | 3.19 |
| Grain type | 2017 | SB | SB | SB | SB | SB | LS |
| | 2018 | LB | SB | NA | SB | SB | LS |
| | 2019 | LB | SB | SB | NA | NA | LS |
| | Mean | LB | SB | SB | SB | SB | LS |
| Grain Chalkiness | 2017 | VOC | VOC | VOC | VOC | VOC | VOC |
| | 2018 | VOC | VOC | NA | VOC | VOC | VOC |
| | 2019 | A | VOC | VOC | NA | NA | VOC |
| | Mean | VOC | VOC | VOC | VOC | VOC | VOC |
| Alkali Spreading Value | 2017 | 4 | 4 | 4 | 4 | 7 | 4 |
| | 2018 | 4 | 4 | NA | 7 | 7 | 4 |
| | 2019 | 4 | 4 | 4 | NA | NA | 4 |
| | Mean | 4 | 4 | 4 | 6 | 7 | 4 |
| Amylose content (%) | 2017 | 22.08 | 24.99 | 25.16 | 25.31 | 24.84 | 25.08 |
| | 2018 | 21.12 | 24.37 | NA | 25.27 | 24.78 | 25.08 |
| | 2019 | 24.2 | 24.64 | 25.54 | NA | NA | 26.22 |
| | Mean | 22.47 | 24.67 | 25.35 | 25.29 | 24.81 | 25.46 |
| Gel Consistency (mm) | 2017 | 50 | 22 | 22 | 33 | 55 | 58 |
| | 2018 | 22 | 30 | NA | 24 | 45 | 50 |
| | 2019 | 24 | 22 | 22 | NA | NA | 49 |
| | Mean | 32 | 25 | 22 | 29 | 50 | 52 |

**Table 7:** DUS characteristics of VL *Dhan* 88

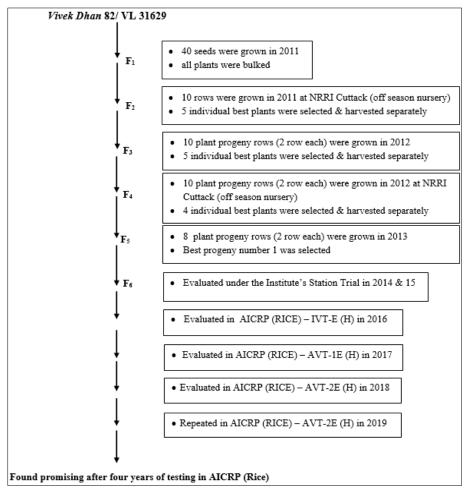| S. No. | Characters and code | Expression and score |
|---|---|---|
| 1. | Basal Leaf: Sheath colour | Green (1) |
| 2. | Leaf: Pubescence of blade surface | Absent (1) |
| 3. | Leaf: Auricles | Present (9) |
| 4. | Leaf: Anthocyanin colouration of auricles | Colourless (1) |
| 5. | Leaf: Shape of ligule | Split (3) |
| 6. | Leaf: Colour of ligule | White (1) |
| 7. | Flag leaf: Attitude of blade (early observation) | Erect (1) |
| 8. | Fag Leaf: Attitude of blade (late observation) | Semi-erect (3) |
| 9. | Time of heading (50% of plant with panicles) | Early (3) |
| 10. | Lemma: Anthocyanin colouration of apex | Absent (1) |
| 11. | Spikelet: Colour of stigma | White (1) |
| 12. | Stem: Length (excluding panicle; excluding floating rice) | Short (3) |
| 13. | Stem: Anthocyanin colouration of nodes | Absent (1) |
| 14. | Panicle: Length of main axis | Medium (5) |
| 15. | Panicle: Curvature of main axis | Semi-straight (3) |
| 16. | Spikelet: Density of pubescence of lemma | Absent (1) |
| 17. | Spikelet: Colour of tip of lemma | White (1) |
| 18. | Panicle: Awns | Absent (1) |
| 19. | Panicle: Colour of awns (late observation) | Not Applicable |
| 20. | Panicle: Distribution of awns | Not Applicable |
| 21. | Panicle: Attitude of branches | Semi erect (5) |
| 22. | Panicle: Exsertion | Well exerted (7) |
| 23. | Sterile lemma: Colour | Straw (1) |
| 24. | Decorticated grain: Length | Long (5) |
| 25. | Decorticated grain: Width | Medium (5) |
| 26. | Decorticated grain: Shape (in lateral view) | Long bold (4) |
| 27. | Decorticated grain: Colour | White (1) |
| 28. | Endosperm: Content of amylose | Medium (5) |
| 29. | Decorticated grain: Aroma | Absent (1) |



**Fig 1:** Flow Chart of pedigree of VL *Dhan* 88 (VL 32224)

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