Notification and release Proposal of

DWRB223

Six-row Hulless Barley Variety
for
Irrigated-Timely Sown Conditions in NWPZ

Submitted to

Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, New Delhi

ICAR-Indian Institute of Wheat & Barley Research
Karnal -132001 (Haryana)

DWRB223

Close-up views of spikes and grains

Waxy leaf sheath and peduncle, slightly waxy and semi erect flag leaf and medium waxy spike

Narrow Creased Grains

Medium Size & Amber Grain

Index

"Salient features of DWRB223"

- DWRB223 is a high-yielding (42.96 q/ha) genotype of six-row hulless barley. It is significantly superior in grain yield over the six and two-row hulless barley check varieties, viz., Karan16 (18.18%) and PL891 (14.13%), respectively, during three years of coordinated yield trials. DWRB223 showed the highest frequency (9/17) in the first non-significant group indicating its stable performance, while both the checks have only (1/17) frequency in Ist NSG.
- In order to optimize the package of production conditions, agronomical trials were conducted under timely and late sown conditions. The proposed genotype DWRB223 revealed least percentage of loss (-30.4%) when sown late in comparison to check varieties *viz.* NDB943 (-41.94%), PL891 (-40.07%), and Karan16 (-37.80%), respectively, indicating better adaptation.
- The proposed genotype DWRB223 is moderately tolerant to lodging, which is a promising feature in barley to realise the yield potential in farmers field.
- DWRB223 is resistant to yellow and brown rusts under artificially inoculated field conditions in NBDSN. In SRT, it had comparative resistance as of the checks.
- DWRB223 has an excellent combination of good nutritional traits like protein (11.7%), ß-glucan (6.0%), zinc (47.8 ppm) and iron (43.7 ppm) and is a fit case for bio-fortified variety. This genotype also showed an advantage for hectolitre weight and bold grain percentage as compared to the six rowed check variety Karan 16.

Proforma for submission of proposals for Release of Crop Variety to Central Sub-Committee on Crop Standards, Notification & Release of Varieties

1.	Name of the crop and species	:	Barley (*Hordeum vulgare* L.)			
2.	a) Name of the variety under which tested in AICRP trials	:	**DWRB223**			
	b) Proposed name of the variety	:	**DWRB223**			
3	Sponsored by (Institute)	:	ICAR-Indian Institute of Wheat and Barley Research, Karnal-132 001 (Haryana)			
4	a) Institution or agency responsible for developing variety (with full address)		ICAR-Indian Institute of Wheat and Barley Research, Karnal-132 001 (Haryana)			
	b) Name of the persons who helped in the development of the variety		**Developers**			
			Dr. Jogendra Singh	Plant Breeder		
			Dr. Omvir Singh	Plant Breeder		
			Dr. RPS Verma	Plant Breeder		
			Dr. Chuni Lal	Plant Breeder		
			Dr. Lokendra Kumar	Plant Breeder		
			Dr. S.K. Bishnoi	Plant Breeder		
			Dr. Rekha Malik	Biotechnologist		
			Dr. Dinesh Kumar	Biochemist		
			Dr. O.P. Gupta	Biochemist		
			Dr. Charan Singh	Plant Breeder		
			Dr. Poonam Jasrotia	Entomologist		
			Dr. Ravindra Kumar	Plant Pathologist		
			Dr. A.S. Kharub	Agronomist		
			Dr. Anil Khippal	Agronomist		
			Dr. Amit Sharma	Plant Breeder		
			Dr. Ajay Verma	Statistician		
			Dr. Ratan Tiwari	Director		
			Technical assistance	Dr. Rajendra Kumar, Sh. Rampal Sh. Ishwar Singh		
5.	a)Parentage (with details of its pedigree including source from which variety has been developed)		PENCO/CHEVRON-BAR/3/LEGACY//PENCO/CHEVRON-BAR			
	b) Source of material in case of introduction		ICARDA, Morrocco (INBYT-HI-(2013)-21)			
	c) DNA profile of variety and checks		**Please see annexure-I**			
	d)Breeding method used		Introduction			
	e)Breeding objectives		Development of high yielding husk less barley genotypes with better quality for food and industrial purpose with tolerance to biotic and abiotic stresses.			
6.	State the varieties which are most closely resemble the proposed variety in general characters	:	**Trait**	**DWRB223**	**Karan16**	**PL891**
			Spike colour	Green	Green	Green
			Spike waxiness	Waxy	Absent	Absent
			Spike length	Medium	Medium	Long
			Grain size	Medium	Medium	Large
7.	Recommended production ecology (Rainfed/Irrigated; high/low fertility)		**Irrigated Timely Sown**			
8.	Specific area of its adaptation (zones	:	North Western Plains Zone (NWPZ) including states of			

	and states for which variety is proposed) and recommended productions ecology		Punjab, Haryana, Delhi, Western UP, Rajasthan (except Kota and Udaipur Divisions)		
9.	Description of hybrid/variety	:	Variety		
10	a) Plant height (cm)	:	105.5 (81.1-129.3)		
	b) Distinguishing morphological characters	:	DWRB223 is a six-row hulless barley genotype with an erect green spike with medium length. Grains are medium in size with amber colour.		
	c) Maturity (range in number of days) (from seedling/transplanting to flowering, seed to seed)	:	138 (122-149) days		
	d) Maturity group (early, medium and late wherever such classification exists)	:	Medium		
	e)Reaction to major diseases under field and controlled conditions (reaction to physiological strains/races/pathotypes/bio-types to be indicated whereever possible)	:	Resistant to yellow and leaf rusts **(Please see table-3a)**		
	f) Reaction to major pests (under field and controlled condition including store pests	**:**	**Please see table-4**		
	g) Agronomic features (e.g. resistance to lodging, shattering, fertilizer resposivness, suitability to early or late sown conditions, seed rate etc).	**:**	Suitable for growing under timely sown conditions in NWPZ with a seed rate of 100 kg/ha **(Please refer Table-2 & Annexure-V)**		
	h) Quality of produce	**:**			
	Grain quality	:	High content of ß-glucan (6% dwb), iron (43.7 ppm) and zinc (47.8 ppm). **(Table 5)**		
	Fodder quality	:	NA		
	i)Reaction to stresses	**:**	Moderately resistant to lodging		
10.	Description of the parents of the hybrid		A line/Inbred 1	B line/Inbred 2	R line
	a)Plant height	:	NA	NA	NA
	b)Distinguishing morphological characters	:	NA	NA	NA
	c)Days to flowering	**:**	NA	NA	NA
	d)Days to maturity (range in number of days- from seed to seed)	**:**	NA	NA	NA
	e) Is there any problem of synchronization? If yes, method to overcome it.	**:**	NA	NA	NA
	f) Reaction to major diseases (Under field and controlled conditions, reaction to physiological strains/races/bio-types/pathotypes to be indicated whereever possible)	**:**	NA	NA	NA
	g)Reaction to major pests (under field and controlled conditions including store pests)	**:**	NA	NA	NA
	h)Agronomic features (e.g. resistance to lodging, shattering, fertilizer, responsiveness, suitability to early or late sown conditions, seed rate etc.)	**:**	NA	NA	NA

	i)Reaction to stresses	:	NA	NA	NA
11	a)Yield data in coordinated trials (breeding, agronomy, pathology, entomology, quality etc.) regional/interregional districts year wise (levels of fertilizer application, density of plant population and superiority over local control/standard variety to be indicated (to be attached)	:	**42.96 q/ha** (The average yield of 17 locations over three years in AICW&BIP trials with potential yield of 64.93 q/ha). **(Please see Table-1 and Annexure II)**		
	b)Yield data from national, demonastration/large scale demonstrations (to be attached)	:	Not conducted		
12	a) Agency responsible for maintaining breeder seed	:	ICAR- Indian Institute of Wheat and Barley Research, Karnal- 132 001 (Haryana)		
	b) Quantity of breeder seed of the variety in stock (kg)	:	5.0 Q		
13	Specific recommendations, if any, for seed production (e.g. staggered sowing, planting ratio of parental lines of hybrids in foundation and certified seed production, probable area of seed production)	:	NA		
14	Vivid presentation (field view, close-up single plant and seed/economic parts)		Photographs of field view and close ups for different descriptors are submitted for information and record		
15	a)Whether recommended by any workshop, seminar, conference, state seed committee etc. b)If so, its recommendations with specific justifications for the release of proposed variety c)Specific area of its adaptation		Recommended by varietal identification committee on 7th October, 2024 under the chairmanship of Dr. D.K. Yadav ADG (Seed), ICAR through virtual mode. **Annexure VI** The genotype was identified based on its yield superiority, yellow rust resistance and grain quality. **North Western Plains Zone (NWPZ),** including states of Punjab, Haryana, Rajasthan and Western UP.		
16	Acknowledgement of submission of seed sample of variety from NBPGR and IC number.		Please see **Annexure VII**		
17	Package of practices along with attainable yield level		Please see **Annexure V**		
18	Any other pertinent information		In terms of grain yield, DWRB223 is the best genotype among all six and two row hulless barley varieties released in India. The average grain yield of this genotype is 42.96 q/ha, and it is significantly superior to all suitable checks of hulless barley in the North Western Plains Zone of the country. In addition to high grain yield, DWRB223 is highly resistant to major diseases of barley and has good quality traits like ß-gluten (6.0% dwb), zinc (47.8 ppm), iron (43.7 ppm), and protein (11.7% dwb). On account of high yielding capacity, high disease resistance and good quality traits, DWRB223 variety is expected to boost the production, productivity and utilization of barley in India. It will be health beneficial and enhance the income of barley stakeholders in the country.		

Signature of all contributers

Name	Signature
Dr. Jogendra Singh	
Dr. Omvir Singh	
Dr. RPS Verma	
Dr. Chuni Lal	
Dr. Lokendra Kumar	
Dr. S.K. Bishnoi	
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Dr. A.S. kharub	
Dr. Anil Kumar Khippal	
Dr. Amit Sharma	
Dr. Ajay Verma	
Dr. Ratan Tiwari	

Signature of head of the institution

(Ratan Tiwari)
Director
ICAR-IIWBR, Karnal

Checklist for proforma for submission of proposal for release of crop-variety to Central Sub-Committee on Crop Standards notification and release of varieties

Details/document	Attached	
Parentage with details of its pedigree including source from which variety/inbred/A, B and R lines of hybrid has been developed.	Yes	~~No~~
Source of material in case of introduction (IC/EC numbers provided by NBPGR).	Yes	~~NO~~
Flow chart of details of development of variety/parental lines of hybrids.	Yes	~~No~~
Molecular/DNA profile of variety/hybrid/A, B, R line of hybrid vis-a-vis check variety/line (details of unique amplicons that distinguishing markers along with photographs	Yes	~~No~~
Detailed description of hybrid/variety	Yes	~~No~~
Detailed description of the parental lines of hybrid	~~Yes~~	No
Yield data and other data on diseases, insect-pests, quality etc. from coordinated trials	Yes	~~No~~
Yield data from national, demostration/large scale demonstrations	~~Yes~~	No
Specific recommendations, if any, for seed production (e.g. staggered sowing, planting ratio of parental lines of hybrids in foundation and certified seed production, probable area of seed production etc.	~~Yes~~	No
Vivid presentation (field view, close-up of single plant and seed) with the help of photographs of the variety	Yes	~~No~~
Recommendation of workshop, conference	Yes	~~No~~
Acknowledgement of submission of seed sample of variety/hybrid/A,B and R lines of hybrid submitted to NBPGR	Yes	~~No~~
Package of practices	Yes	~~No~~
Proforma signed by all co-authors and Head of Organization	Yes	~~No~~
Any other pertinent information	Yes	~~No~~

Signature of Head of Institution

(Ratan Tiwari)
Director
ICAR-IIWBR, Karnal

Varietal Description of DWRB223

1.	Growth Habit	Semi-prostrate
2.	Anthocyanin pigmentation of	
	a. Coleoptile	Absent
	b. Leaf sheath	Absent
	c. Auricle (at flag leaf stage)	Absent
3.	Foliage colour (Boot stage)	Green
4.	Leaf width (Boot stage)	wide
5.	Average days to heading	97days
6.	Average days to maturity	138days
7.	Waxiness (at ear emergence)	
	(a) Leaf Sheath	Waxy
	(b) Ear	Waxy
	(c) Peduncle	Waxy
8.	Average plant height (cm)	105.5cm
9.	Ear colour at maturity	Yellow
10.	Ear shape	Parallel
11.	Ear density	Intermediate
12.	Ear type	Six-row
13.	Lateral florets	NA
14.	Ear attitude	Erect
15.	Awns length	Long
16.	Awn colour (at maturity)	Yellow
17.	**Grain traits:**	
	Colour	Amber
	Surface	Smooth
	Aleuronic layer colour	NA
	Texture	Soft
	Size	Medium
	Crease Width	Narrow
	Rachilla hair	Rudimentary
	Shape	Oblong
	Avg. 1000 grain weight (gm)	36.7 g
	Hulled/Hulless	Hulless

Table-1: Summary of yield data of coordinated trials

Name of the proposed variety: **DWRB223** Name of the crop: **Barley**
Adaptability Zone: **NWPZ** Production condition: **Irrigated Timely Sown**

Mean yield (q/ha) a) Zonal b) Across zonal (if applicable)	**Year of testing**	**No. of Trials**	**DWRB223 (6R-P)**	**Karan16 (6R-C)**	**PL891 (2R-C)**	**CD**
	2021-22	6	46.05*	37.50	43.84	1.35
	2022-23	6	36.18*	33.99	31.40	1.58
	2023-24	5	47.40*	37.80	37.70	1.13
	Weighted mean	17	42.96*	36.35	37.64	
% of increase or decrease in the grain yield of proposed variety over the checks & qualifying varieties	Over the respective weighted mean	17	-	+18.18	+14.13	
Frequency in the top group (Pooled for 3 years)	Overall	17	9/17	1/17	1/17	

***Significantly superior to both checks**

Table-2: Agronomical trials to optimize the package of production condition

Name of proposed variety**: DWRB223** Name of the crop**: Barley**
Adaptability Zone**: NWPZ** Production condition**: Irrigated Timely Sown**

Variety	**Timely Sown**	**Late Sown**	**% loss in grain yield under late sowing**
	Zonal mean of Grain yield (q/ha)	**Zonal mean of Grain yield (q/ha)**	
DWRB223	41.59	28.95	-30.39*
PL891 (C)	44.85	26.88	-40.07
Karan16 (C)	53.81	33.47	-37.80
NDB943 (C)	46.87	27.21	-41.95

Locations: Durgapura, Karnal and Ludhiana (CD 0.05= 1.48 for varieties and 0.58 for sowing, respectively), *Minimum yield loss under late sowings

Table-3 (a): Reaction to important diseases at adult plant stage

Diseases	Year	DWRB223 (6R-P)	Karan-16 (6R-C)	PL891 (2R-C)
Yellow rust (Adult Plant Resistance)	2021-22	8.6 (30S)	10.3 (60S)	11.8 (20S)
	2022-23	7.3 (40S)	25.7 (60S)	3.0 (10S)
	2023-24	5.0 (20S)	37.3 (80S)	7.0 (20S)
Leaf rust (Adult Plant Resistance)	2021-22	0	5S	0
	2022-23	0	10S	0
	2023-24	0	0.4	0
Leaf Blights	2021-22	56 (99)	46 (58)	56 (99)
	2022-23	45 (78)	46 (57)	35 (57)
	2023-24	34 (79)	46 (68)	35 (68)

Table-3 (b): Reaction to different pathotypes of rust diseases at seedling stage

Name of the Variety: DWRB223			**Name of the crop: Barley**		
Adaptability Zone: NWPZ			**Production condition: Irrigated, Timely sown**		
Diseases/Pathotypes		**Year**	**DWRB223(6R-P)**	**Karan-16 (6R-C)**	**PL891(2R-C)**
Yellow rust	M	2021-22	S	S	S
		2022-23	S	S	R
		2023-24	MS	S	-
	57	2021-22	R	R	R
		2022-23	S	S	-
		2023-24	MS	-	-
	24	2021-22	S	R	MS
		2022-23	S	S	-
		2023-24	R	S	R
	G	2021-22	R	R	MS
		2022-23	S	S	R
		2023-24	S	-	-
	Q	2021-22	MS	S	S
		2022-23	S	S	-
		2023-24	S	-	MS
	6S0	2021-22	S	R	R
		2022-23	MS	-	R
		2023-24	S	-	-
	7S0	2021-22	-	-	-
		2022-23	-	-	-
		2023-24	R	-	R
Black rust	11	2021-22	S	MR	S
		2022-23	R	R	-
		2023-24	R	-	R
	21A-2	2021-22	MS	R	R
		2022-23	S	MR	R
		2023-24	MS	-	-
	40A	2021-22	MS	S	R
		2022-23	MS	R	-
		2023-24	R	-	R
	117-6	2021-22	R	R	S
		2022-23	R	MR	R
		2023-24	R	-	-
	122	2021-22	R	MR	S
		2022-23	S	-	-
		2023-24	-	-	R
Brown rust	H_1	2021-22	R	R	R
		2022-23	R	S	-
		2023-24	-	-	-
	H_2	2021-22	R	R	R
		2022-23	R	MS	R
		2023-24	R	MS	-
	H_3	2021-22	MS	R	R
		2022-23	R	MS	R
		2023-24	-	-	R
	H_4	2021-22	S	R	R
		2022-23	R	-	-
		2023-24	R	-	-
	H_5	2021-22	MS	R	-
		2022-23	-	MS	-
		2023-24	R	-	R

Table-4: Reaction to major insect/ pests

Pests	Year	DWRB223 (6R-P)	Karan16 (6R-C)	PL891 (2R-C)
Aphids (HS)	2021-22	4.8 (5.0)	4.4 (5.0)	4.8 (5.0)
	2022-23	4.3 (5.0)	4.7 (5.0)	4.0 (5.0)
	2023-24	3.0 (5.0)	4.0 (5.0)	3.2 (5.0)
Nematode	2021-22	HS	S	HS
	2022-23	-	HS	S

Table-5: Data on grain quality characteristics

Grain Quality	DWRB223 (6R-P)	Karan-16 (6R-C)	PL891 (2R-C)
Hectolitre weight (g)	71.1	72.8	71.5
1000-grain weight (g)	36.7	35.1	42.1
Bold grain (%) (>2.5 mm)	49.5	34.2	49.7
Protein (%)	11.7	11.8	12.5
β-glucan (%)	6.0	5.0	6.3
Zinc (ppm)	47.8	30.4	36.6
Iron (ppm)	43.7	42.7	40.3

Table-6: Data on other important characteristics under AICRIP Trials

Traits	Year	DWRB223 (6R-P)	Karan-16 (6R-C)	PL891 (2R-C)
Days to Heading	2021-22	90	94	91
	2022-23	89	86	96
	2023-24	97	95	99
	Mean	**92.0**	**91.7**	**95.3**
Days to maturity	2021-22	132	132	130
	2022-23	127	127	131
	2023-24	138	140	139
	Mean	**132.3**	**133.0**	**133.3**
Plant height (cm)	2021-22	101.0	112.0	102.0
	2022-23	101.9	101.7	108.2
	2023-24	105.5	99.4	105.3
	Mean	**102.8**	**104.4**	**105.2**
Tillers/meter	2021-22	135	137	108
	2022-23	109	121	128
	2023-24	93	77	97
	Mean	**112.3**	**111.7**	**111.0**
1000-grain weight (g)	2021-22	32.3	33.9	35.8
	2022-23	40.0	36.0	45.0
	2023-24	37.9	35.3	45.5
	Mean	**36.7**	**35.1**	**42.1**
Spike length (cm)	2021-22	8.0	7.2	9.1
	2022-23	8.0	8.0	10.0
	2023-24	8.0	10.0	11.0
	Mean	**8.0**	**8.4**	**10.0**

Annexure-I(a)

DNA Finger Printing Data

Amplicons size of molecular markers screened with entry DWRB223 and its checks

SN	Marker	Chr	DWRB223	K1149(c)	KARAN16(c)	PL891(c)
1	**Bmac154**	1H	110	130	130	130
2	**Bmac213**	1H	155	168	180	180
3	**Bmag382**	1H	109	109	109	109
4	**Bmag579**	1H	110	110	126	126
5	**MGB402**	1H	240	260	260	260,240
6	**ScSSR10477**	1H	200	150	150	200
7	**HvHVA1**	1H	136	136	136	136
8	**Bmac175**	2H	155	180	155	180
9	**EBmac640**	2H	190	190	176	190
10	**Bmag15**	2H	181	181	181	181
11	**EBmac525**	2H	149	125	149	149
12	**EBmac623**	2H	168	154	154	168
13	**cMWG658**	2H	600	600	600	600
14	**Ebmatc39**	2H	150	150	150	150
15	**Bmag006**	3H	274	274	274	274
16	**Bmag603**	3H	140	122	140	122
17	**Bmag877**	3H	165	165	165	165
18	**Ebmac541**	3H	140	120	140	140
19	**MWG 847**	3H	345	345	345	345
20	**Bmag225**	3H	165	185	185	185
21	**HvLTPPB**	3H	216	200	200	216
22	**Bmag841**	3H	115	115	125	115
23	**ABG500**	4H	189	189	189	189
24	**HVM40**	4H	160	150	160	160
25	**HVM67**	4H	136	126	136	136
26	**HvMLOH1A**	4H	185	175	185	175
27	**Ksug10**	4H	1500	1500	1500	1500
28	**MWG634**	4H	800	800	800	800
29	**WG622**	4H	161	161	161	161
30	**Bmag353**	4H	119	119	119	90
31	**Bmag337**	5H	165	130	130	130
32	**Bmag751**	5H	189	189	189	189
33	**Bmag812**	5H	167	147	157	167
34	**GMS61**	5H	145	135	145	135
35	**Bmac303**	5H	138	119	138	119
36	**ABG458**	6H	248	248	248	248
37	**Bmac40**	6H	210	210	236	210
38	**Bmac500**	6H	150	110	190	110
39	**GBM1215**	6H	240	240,200	240	240,200
40	**HVM11**	6H	185	175	150	175
41	**MWG2029**	6H	245	245	245	245
42	**ABC15864**	7H	167	167	167	167
43	**Bmac64**	7H	140	155	155	140
44	**Bmac162**	7H	187	200	187	187
45	**Bmac167**	7H	NULL	195	184	195
46	**Bmag110**	7H	160	145	135	145

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp ladder.

Annexure-I (b)

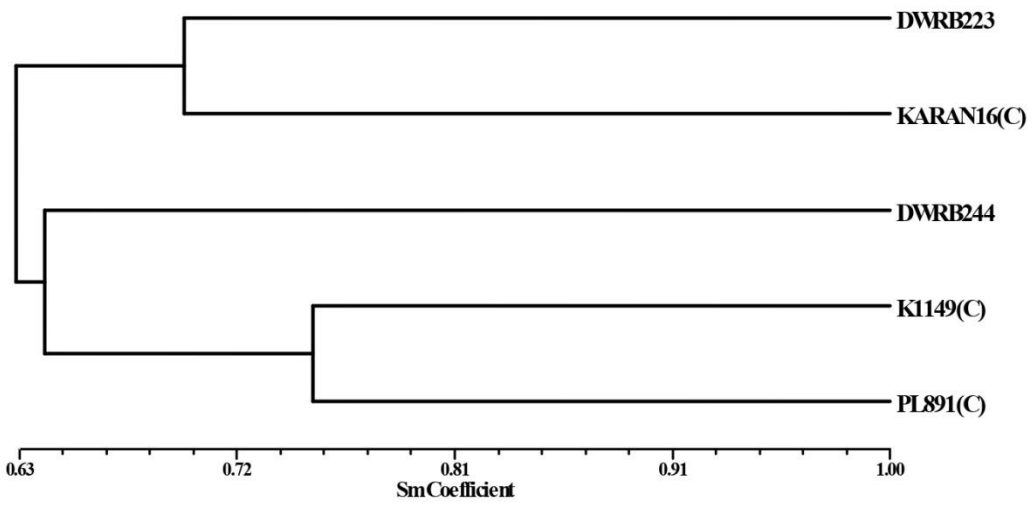

Fig.1: Molecular markers assisted UPGMA based genetic diversity among DWRB223 and checks.

Annexure-II

Location wise yield data (q/ha) during coordinated trials (2021-22 to 2023-24)

Year	Location	DWRB223	Karan16 (6R-C)	PL891 (2R-C)
First year (2021-22)	Durgapura	62.80	56.76	57.97
	Hisar	40.94	33.12	36.29
	Karnal	49.81	39.17	30.93
	Ludhiana	23.55	23.19	32.25
	Modipuram	58.88	42.42	55.04
	Pantnagar	40.33	30.34	50.54
Second year (2022-23)	Durgapura	43.04	48.43	35.51
	Hisar	34.20	31.64	20.82
	Karnal	40.66	31.65	27.65
	Ludhiana	25.60	26.57	29.23
	Modipuram	49.56	38.29	40.78
	Pantnagar	24.04	27.35	34.40
Third year (2022-24)	Durgapura	64.93	50.25	51.65
	Hisar	35.62	24.79	22.97
	Karnal	46.2	34.9	32.8
	Ludhiana	35.14	29.06	32.39
	Modipuram	55.11	50.28	48.45

Annexure-III

Year wise performance for important grain traits (2021-24)

Grain quality	Year	DWRB223 (6R-P)	Karan-16 (6R-C)	PL891 (2R-C)
Hectolitre weight (kg/hl)	2021-22	62.9	70.8	70.6
	2022-23	72.5	71.6	69.1
	2023-24	77.8	76.1	74.7
	Mean	**71.1**	**72.8**	**71.5**
1000 grain weigh (g)	2021-22	32.3	33.9	35.8
	2022-23	40.0	36.0	45.0
	2023-24	37.9	35.3	45.5
	Mean	**36.7**	**35.1**	**42.1**
Bold grain (%) (>2.5mm)	2021-22	38.0	40.0	38.3
	2022-23	52.7	31.3	45.5
	2023-24	57.8	31.4	65.2
	Mean	**49.5**	**34.2**	**49.7**
Protein (%)	2021-22	10.2	11.9	11.8
	2022-23	12.7	11.7	13.7
	2023-24	12.1	11.9	11.9
	Mean	**11.7**	**11.8**	**12.5**

Annexure-IV

FLOW CHART/OUTLINE FOR VARIETAL DEVELOPMENT

Genotype received from ICARDA as INBYT-HI-(2013)-21 with parentage (PENCO/CHEVRON-BAR/3/LEGACY//PENCO/CHEVRON-BAR) in 2013.

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Genotype was evaluated in augmented block design at ICAR-IIWBR Farm, Hisar during 2013-14, 2014-15 and 2015-16.

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Selected Genotype was evaluated in station trials during 2016-17, 2017-18, 2018-19 and 2019-20 at ICAR-IIWBR Farm, Hisar

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Seed Multiplication in 2020-21

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Submission as DWRB223 in IVT-IRTS-NB (Hulless Barley) (2021-22)

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AVT-IRTS-NB (Hulless Barley) (2022-23)

↓

AVT-IRTS-NB (Hulless Barley) (2023-24)

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Submitted for identification during 63rd AICRPW&B Research Workers, Meet at ANDUA&T, Kumarganj (Septmeber 11-13, 2024)

Annexure-V

PACKAGE OF PRACTICES

Name of proposed variety: **DWRB223** Name of the crop: **Barley**
Adaptability Zone: **NWP Zone** Production condition:**Irrigated Timely Sown**

SN	Particulars	Details
1	Suitability of the variety for the area (Recommended area for which variety has been released/recommended	**North Western Plains Zone** (including states of Punjab, Haryana, Delhi, Western U.P. and Rajasthan except Kota and Udaipur divisions).
2	Selection of field/land preparation (Type of topography, soil condition, tillage operation for seed bed, etc.)	Well drained, moderately fertile, loam or light soil with plain topography and properly levelled.
3	Seed treatment (Recommended chemical with dosages)	Carboxin 37.5 % + Thiram 37.5% WS @ 3g/kg seed or Tebuconazole 2DS @ 1gm/kg of seed.
4	Sowing Time (Optimum sowing period)	10-25 November **(Irrigated timely sown conditions)**
5	Seed rate/sowing method	100 kg/ha, sowing by seed drill with 23 cm row to row spacing
6	Fertilizer doses & Time of fertilizers application (Type and quantity of fertilizers)	NPK: 60 kg/ha : 30 kg/ha : 20 kg/ha (1/2 N + full P & K as basal dose and remaining 1/2 N at the time of first irrigation as top dressing).
7	Weed Control (name of weedicide (s) with doses and timing of mechanical weeding, if any)	Pendimethalin (Stomp 30 EC) 3125-3750 ml/ha* in 300 L of water within 2-3 days after sowing. Isoproturon 1250 g/ha* or Pinoxaden at 30-35 days after sowing using 300 L of water. *Product dose.
8	Major diseases and pest control (Type of pest and diseases with name of chemicals and doses & timing of application)	**Diseases & pests:** Yellow and brown rusts, loose and covered smuts, leaf blights and aphids. **Control:** One spray of propiconazole 25 EC (Tilt 25 EC) or Tebuconazole 250 EC (Folicur 250 EC) or Triademefon (Bayleton 25 WP) @ 200 ml of fungicide mixed with 200 litres of water should be sprayed in one acre crop. To control aphids apply Confidor (Imidacloprid 200 SL) @ 20g a.i./ha
9	Irrigation schedule (Critical stage for irrigation and method of irrigation)	First irrigation at active tillering (30-35 DAS), second at flag leaf stage (60-65 DAS), and third at the milking stage (80-85 DAS).
10	Harvesting (Approximate days)	Approx. average 138 days
11	Quality characteristics of the variety, if any (Prominent characteristics of variety)	High β-glucan (6.0% dwb), Fe (43.7 ppm) and Zn (47.8 ppm)
12	Expected yield of the variety per acre (yield subject to use under area of adaptation and recommended climate conditions and adoption of package and practices)	Average 18-19 q/acre

Note: These are standard package and practices, which may vary with environmental fluctuations.