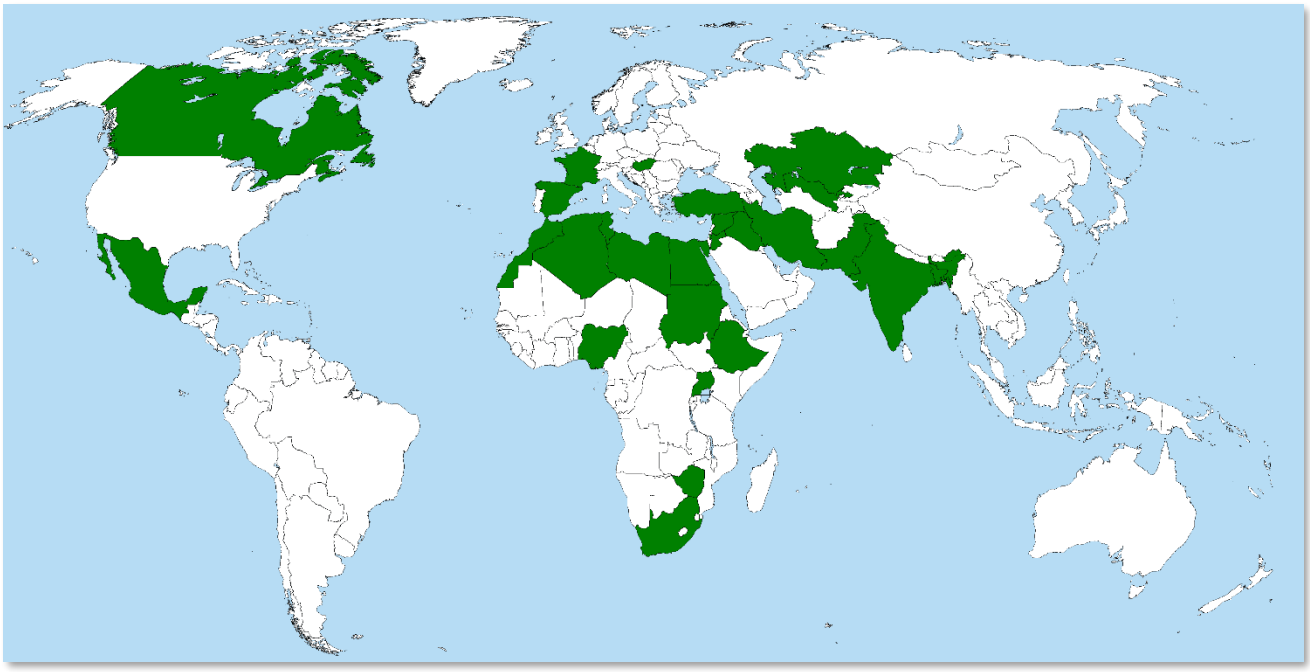
RESEARCH PROGRAM ON Livestock

More meat, milk and eggs by and for the poor

2022 ICARDA global barley breeding program International Nurseries



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CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The CGIAR Research Program on Livestock brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock, the International Centre for Tropical Agriculture (CIAT) which works on forages, the International Center for Agricultural Research in the Dry Areas (ICARDA) which works on small ruminants and dryland systems, the Swedish University of Agricultural Sciences (SLU) with expertise particularly in animal health and genetics and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which connects research into development and innovation and scaling processes.

The CGIAR Research Program on Livestock thanks all donors and organizations who globally supported its work through their contributions to the **CGIAR system.**

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Contents

Introduction

ICARDA has the CGIAR global mandate to breed barley varieties for the developing World. As such, more than 250 spring and winter 2-row, 6-row and naked barley varieties of ICARDA origin have been released in 46 countries, 51 of them in the last 10 years. Besides direct releases, there are large evidence of impact of ICARDA germplasm in both developed and the developing World's breeding programs.

For the 2021/22 cropping season, the ICARDA Global Barley Breeding Program assembled 3 new nurseries, two yield trials and one observation nursery, that represent the best elite germplasm of all four MegaProduct Lines the program works on: Feed Barley for Arid and Semi-Arid regions, Food and Fodder Barley, Feed and Forage Barley for Favorable Environments and Malt and Fodder Barley. The 2022 International Barley Yield Trial for Arid and Semi-Arid regions (22-IBYT-ASA) contains 24 genetically diverse barley genotypes (including two international checks and one local/national one) targeting two product lines: Feed Barley for Arid and Semi-Arid environments (Feed4Drylands) and Food&Fodder Barley. The 2022 International Barley Yield Trial for Feed Forage and Malt for Favorable Environments (22-IBYT-FFM) trial contains 24 genetically diverse barley genotypes (including two international checks and one local/national one) targeting two product lines: Feed and Forage Barley for Favorable Environments and Malt&Fodder Barley. The 2022 International Barley Observation Nursery (22-IBON) consists in 103 advanced barley genotypes representing the genetic diversity of the Breeding Program and includes barley lines targeting the four main MegaProduct Lines.

A total of 128 sets of the nurseries have been distributed upon demand to 27 countries in North America, Europe, the Mediterranean Basin, East, West and South Africa and West, Central and South Asia.

2022 Barley international nurseries

The Global Barley Breeding program, following the recommendations of the CGIAR Excellence in Breeding (EiB) Platform, the program has adopted a strategy based on the systematic use of product profiles and on rapid development of new genotypes that maintain the successful traits of existing key varieties (benchmarks) and incorporate new traits including tolerance to new stresses and better end-use quality.

The product profiles designed in collaboration with the NARS are then grouped in 4 Product Lines:

- **Feed Barley for Arid and Semi-Arid regions**: consisting in mostly 6-row barley advanced genotypes with high grain and straw productivity and stability from mild to severe drought conditions. The lines are selected in trials from the hot and dry semi-desertic regions of North Africa to the cold and dry West Asian highlands and the short, hot and dry rabi season in Central India.
- **Food and Fodder Barley**: consists in advanced drought tolerant and mostly hull-less genotypes combining high grain size and yield with enhanced nutritional quality (β-glucan, Iron and Zinc content) and straw production. These lines are particularly adapted to mountainous areas.
- **Feed and Forage Barley for Favorable Environments**: consisting in barley advanced genotypes combining high grain and biomass production, diseases and lodging resistance. Lines with early vigor and regeneration capacity to be used for grazing are also included.
- **Malt and Fodder Barley**: consisting in mostly 2-row barley advanced genotypes combining high grain size and stability, malting quality in agreement with international industrial standards with disease and lodging resistance and high straw production.

The **2022 International Barley Yield Trial for Arid and Semi-Arid regions** (22-IBYT-ASA)

Trial and distribution

The 22-IBYT-ASA trial contains 24 genetically diverse barley genotypes (including two international checks and one local/national one) targeting two product lines: Feed Barley for Arid and Semi-Arid environments (Feed4Drylands) and Food&Fodder Barley. It is suggested to grow the IBYT-ASA in 2 replications with 6 rows and 2.5 meters long plot in the layout provided under low input conditions.

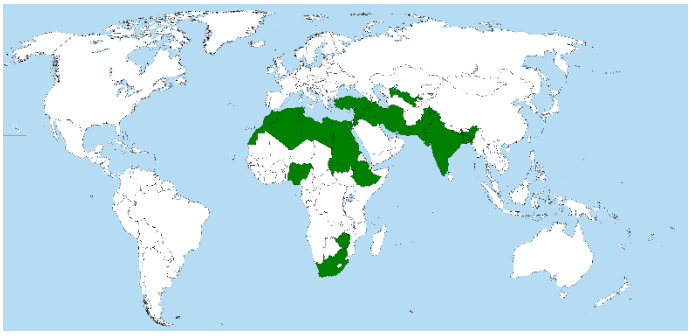

Figure 1 Distribution of the 22-IBYT-ASA

Forty-six sets of the 22-IBYT-ASA nursery were distributed in 2021 to 20 countries in Africa and Asia (Figure 2)

Yield performance

The lines selected from the Feed Barley for Arid and Semi-Arid environments (Feed4Drylands) MegaProduct Profile consist in 18 genotypes, 10 of them of 6row type and 8 of 2row type (Table 1). The lines were selected based on their superior yield and biomass production as well as good stability that can ensure the productivity under severe drought events as well as under more favorable conditions. Th e lines were tested in 5 field trials before selection in Morocco, India and Lebanon. From the extreme

drought environment of Jemaa Shaim in western Morocco to the cold location of Kfrdan in Lebanon lines such as n15 and n16 were selected due to their high grain an biomass production and stability. On the other hand, lines such as 17 and 13 showed specific adaptation to favorable and extremely drought environments respectively.

The trial also includes 3 elite lines from the Food and Fodder MegaProduct Profile. These are high yielding naked barley lines with good straw production and grain size. The lines are also tested for biofortification traits such as iron, zinc and B-glucans. The three lines included in the trial showed superior yields as compared to the checks both under low and high input conditions and high dynamic stability.

Disease resistance

The 21 elite genotypes were tested in 3 hotspot locations in Morocco under natural infection to identify their reaction to local races of Leaf Rust, Net Form of Net Blotch (NFNB) and Spot Form of Net Blotch (SFNB). The results showed that most of the lines are resistant or moderately resistant to NFNB (Table 1). Lower levels of resistance to leaf rust are acceptable while for SFNB the reaction can be environment dependent. However, some lines such as n3, n7 n23, and especially n15, one of the highest yielding and most stable entries, showed good levels of resistance across pathogens and locations.

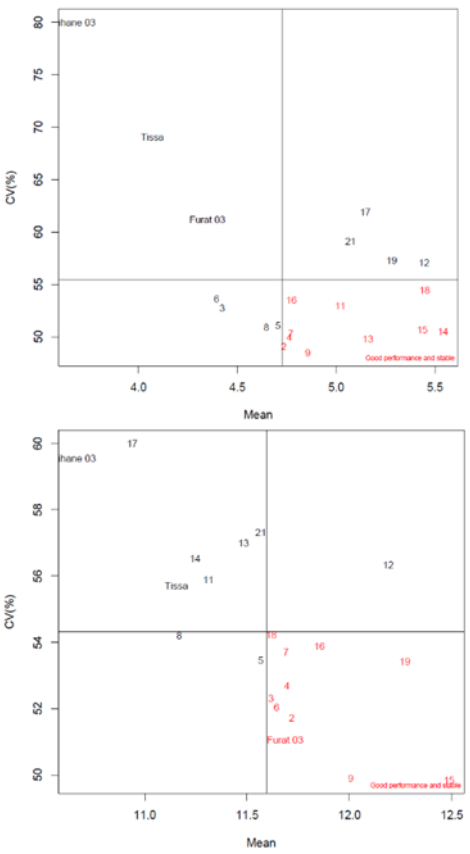

Figure 2 Biplot of the average grain (Top graph) and biomass (bottom graph) yield of 18 elite barley genotypes from the IBYT-ASA at 5 location in Morocco, India and Lebanon and their yield stability accross the environments. In red are highlighted the genotypes showing both high performance and stability. The numbers represent the genotype entry numbers (see Table 1)

The **2022 International Barley Yield Trial for Feed Forage and Malt for Favorable Environments** (22-IBYT-FFM)

Trial and distribution

This trial contains 24 genetically diverse barley genotypes (includin g two international checks and one local/national one) targeting two product lines: Feed and Forage Barley for Favorable Environments and Malt&Fodder Barley. It is suggested to grow the IBYT-FFM in 2 replications with 6 rows and 2.5 meters long plot in the layout provided under low input conditions.

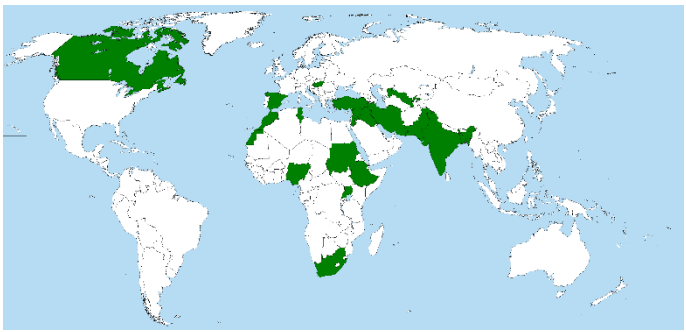

Figure 3 Distribution of the 22-IBYT-FFM

Thirty-six sets of the 22-IBYT-FFM nursery were distributed in 2021 to 19 countries in North America, Europe, Africa and Asia (Figure 3)

Yield performance

The lines selected from the Feed and Forage Barley for Favorable Environments (Feed&Forage) MegaProduct Profile consist in 17 genotypes, 9 of them of 6row type and 8 of 2row type (Table 2). The lines were selected two years of multi-location testing in research stations in North Africa and West and South Asia. The main traits selected are superior yield and straw production, wide and specific adaptation to targeted agroecologies, early vigor and forage production, disease resistance and grain and straw quality. The testing locations consist on generally medium to high rainfall or irrigated environments with or without sporadic drought events, cold and heat stresses and long and short cycles. Entries like n23, n24, n11 and n19 showed high yield performance and stability across environments while entries like n11 showed specific adaptation to short cycle environments and heat stress. Entries such as n24, n13 and n17 showed good straw production and stability, in fact n24 combined yield and biomass performance and stability across environments.

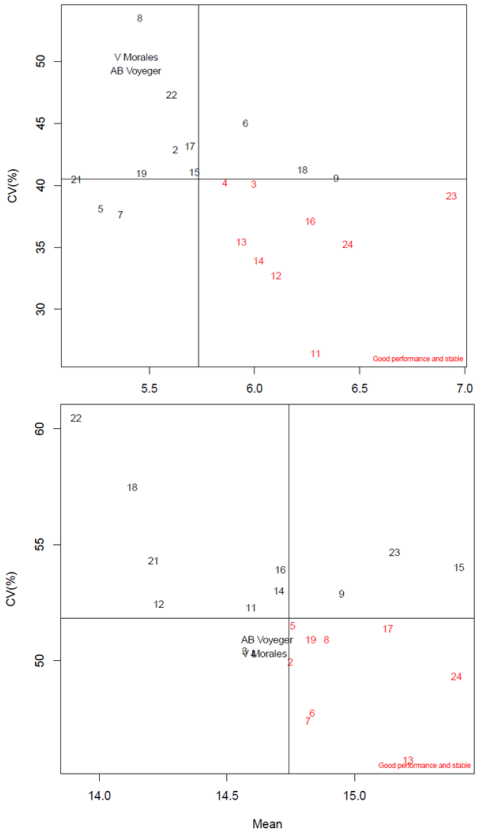

Figure 4 Biplot of the average grain (Top graph) and biomass (bottom graph) yield of 21 elite barley genotypes from the IBYT-FFM at 5 location in Morocco, India and Lebanon and their yield stability accross the environments. In red are highlighted the genotypes showing both high performance and stability. The numbers represent the genotype entry numbers (see Table 2)

The lines selected from the Malt and Fodder MegaProduct Profile were all 2rowed and showed consistently high grain size and caliber (TKW>45mg and more than 90% caliber ≥2.5mm). They also showed good malting quality in micromalting testing. Entry n9 showed high yield performance and adaptation to long cycled and cool favorable environments while n3 and n14 showed more wide adaptation and good yield performance. Entry n9 also showed high fodder production.

Disease resistance

The 21 elite genotypes were tested in 3 hotspot locations in Morocco under natural infection to identify their reaction to local races of Leaf Rust, Net Form of Net Blotch (NFNB) and Spot Form of Net Blotch (SFNB). The results showed good levels of resistance to SFNB and NFNB in all the lines and lower levels for leaf rust. However, most of the lines (up to 14 of them) were resistant or moderately resistant to all three diseases in all the locations tested.

The **2022 International Barley Observation Nursery** (22-IBON)

Trial and distribution

This trial consists in 103 advanced barley genotypes representing the genetic d iversity of the Breeding Program displayed in an replicated check design with 4 checks, 3 international and one local (Table 3). The nursery includes barley lines targeting the four main MegaProduct Lines and can be conducted as 2 rows of 2.5 meters plot in augmented design as per the layout provided.

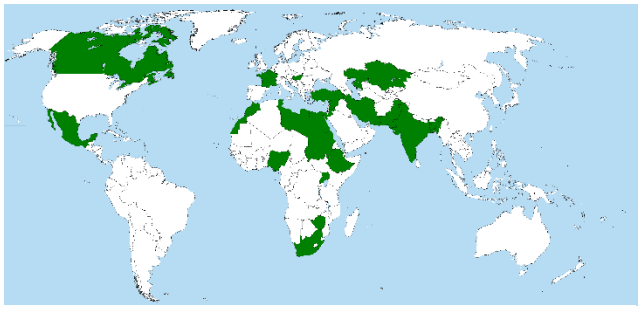

Figure 5 Distribution of the 22-IBON in 2021

Forty-six sets of the 22-IBON nursery were distributed in 2021 to 22 countries in North America, Europe, Africa and Asia (Figure 5).

The set was selected to provide genetic diversity and adaptation to different growing conditions and end-uses. An example of the genetic diversity of the panel is that up to 132 different parents were used in the 93 diferent combinations (Figure 6).

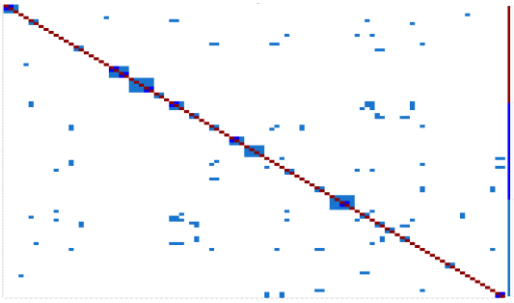

Figure 6 Pedigree matrix of the 103 elite barley lines selected for the 22-IBON. Light blue colours represent half-sister lines; dark blue colours represent full sister lines and red colours represent the same line.

Acknowledgements

Sincere acknowledgements are expressed to CRP Livestock for supporting this research on barley at ICARDA. The authors would like to thank the Arab Found for Economic & Social Development for their contribution to this activity. Also thanks to the International Nursery team and the Seed Systems team led by Dr Bishaw and Dr Niane for their efforts during IN multiplication and distribution. The work of the ICARDA Seed Health laboratory in Terbol led by Dr Kumari is acknowledge for their continuos support. The author would like to thank the contribution of ICARDA Integrated Pest Management team under the lidership of Dr S. Kemal for their contribution to this work. Finally, the barley team at ICARDA (especially Dr. A Visioni, Mr. Sunil Kumar, Mr. Rachid Bouamar, Mr Raafat Azzo and Mr. Boukri Mohamad) is acknowledged.

Table 1. The 2022 International Barley Yield Trial for Arid and Semi-Arid regions (22-IBYT-ASA).

Entry	Pedigree	Selection History	MPP	RT	Germplasm Id	Traits
1	Local check					
2	Soufara-02/3/RM1508/Por//WI2269/4/Hml-02/ArabiAbiad//ER/Apm/5/Keel	ICB10-1145-0AP-035AUB-020TR-2AUB-0MR	Feed4Drylands	2R	7563	Wadapt, StrawY, TKW, R to NFNB, MR to SFNB
3	Soufara-02/3/RM1508/Por//WI2269/4/Hml-02/ArabiAbiad//ER/Apm/5/Harmal	ICB10-1118-0AP-035AUB-020TR-3AUB-0MR	Feed4Drylands	2R	7407	StrawY, TKW, MR to LR, MR to NFNB, MR to SFNB
4	CANELA//E.ACACIA/DEFRA/4/CLI18/E.QUEBRANCHO//E.QUEBRANCHO/NCL95109/3/CANELA	RSI/ICJ11-12B017S-2CJ-05CH-05CJ-2CH-0CJ-0MR	Feed4Drylands	2R	7492	Wadapt, StrawY, TKW, MR to LR, MR to SFNB
5	80.5162/MSEL//GLORIA-BAR/IAR.H.485/3/PETUNIA 2/M111	HIICB12-295-0TR-0MR-0MR-0MR-5MR-0MR	Feed4Drylands	2R	7524	GY, Wadapt, TKW, MR to LR, MR to NFNB, MR to SFNB
6	CONCHITA//Canela	HIICB12-064-0TR-0TR-0MR-0MR-9MR-0MR	Feed4Drylands	2R	7503	GY, H&D, StrawY, TKW, MR to SFNB
7	Soufara-02/3/RM1508/Por//WI2269/4/Hml-02/ArabiAbiad//ER/Apm/5/Harrington/Arta	ICB10-1127-0AP-035AUB-020TR-3AUB-0MR	Feed4Drylands	2R	7414	GY, Wadapt, StrawY, TKW, MR to LR, MR to SFNB
8	MADRE_SELVA//ER/Apm	ICB11-0160-0MC-0MC-0MC-1MR-0MR	Feed4Drylands	2R	7566	GY, H&D, Wadapt, TKW, Mr to SFNB
9	Mo.B1337/WI2291//Moroc9-75/3/Keel/5/ChiCm/An57//Albert/3/Alger/Ceres.362-1-1/4/Arta	ICB10-1185-0AP-035AUB-020TR-1AUB-0MR	Feed4Drylands	2R	7546	GY, Wadapt, StrawY, TKW, MR to SFNB
10	Rihane-03			6R		
11	ATACO/BERMEJO//HIGO/3/CALI92/ROBUST/4/PETUNIA 1/5/PETUNIA 1/CHINIA/3/ATACO/BERMEJO//HIGO/6/ZIGZIG/3/M9846//CCXX14.ARZ3/PACO/8/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/M111/7/LEGACY/3/SVANHALS-BAR/MSEL//AZAF/GOB24DH	HIICB12-298-0TR-0MR-0MR-0MR-9MR-0MR	Feed4Drylands	6R	7309	H&D, MR to LR, MR to NFNB
12	Lignee527/NK1272//JLB70-063/3/Rhn-03/6/Rhn//Bc/Coho/3/DeirAlla106//Api/EB89-8-2-15-4/5/CM67/3/Apro//Sv02109/Mari/4/Carbo	ICB09-0684-0AP-0AP-025AUB-2AUB-0MR	Feed4Drylands	6R	7356	GY, CT, StrawY, R to LR, MR to NFNB
13	SUNU/UC960	UCD13-130-0UCD-0UCD-0MR-0MR-1MR-0MR	Feed4Drylands	6R	7295	H&D, MR to NFNB
14	G12068 F3 13/030043	H00011003/H03010040-0MR-0MR-3MR-0MR	Feed4Drylands	6R	7334	GY, Wadapt, MR to NFNB
15	Lignee527/NK1272//JLB70-063/3/Rhn-03/6/QB813-2/5/Aths/Lignee686/4/Rhn-03/3/Bc/Rhn//Ky63-1294	ICB09-0687-0AP-0AP-025AUB-5AUB-0MR	Feed4Drylands	6R	7352	GY, Wadapt, CT, StrawY, MR to LR, R to NFNB, MR to SFNB
16	ATACO/BERMEJO//HIGO/3/CALI92/ROBUST/4/PETUNIA 1/5/PETUNIA 1/CHINIA/3/ATACO/BERMEJO//HIGO/6/ZIGZIG/3/M9846//CCXX14.ARZ3/PACO/7/ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104	HIICB12-528-0TR-0TR-0MR-0MR-3MR-0MR	Feed4Drylands	6R	7389	H&D, StrawY, MR to NFNB,
17	Sawsan/Badia//Arar/3/Gloria'S'/Copal'S'/6/Rhn-03/Eldorado/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda	ICB10-0385-0AP-025AUB-015TR-4AUB-0MR	Feed4Drylands	6R	7390	GY, H&D, StrawY, MR to NFNB, MR-MS to SFNB
18	QB813-2/5/Aths/Lignee686/4/Rhn-03/3/Bc/Rhn//Ky63-1294/6/Hma-02//11012-2/CM67/3/Alanda/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda	ICB10-0213-0AP-025AUB-015TR-3AUB-0MR	Feed4Drylands	6R	7263	H&D, StrawY, MR to LR, MR to NFNB
19	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA/7/PFC9214//PENCO/CHEVRON-BAR	HIICB12-509-0TR-0TR-0MR-0MR-10MR-0MR	Feed4Drylands	6R	7270	StrawY, TKW, R to NFNB,
20	Furat 03					
21	Doña Josefa/3-1MBN11	RSI/ICJ11-12B107S-2CJ-05CH-05CJ-1CH-0CJ-0MR	Feed4Drylands	6R	7367	GY, R to NFNB
22	UC1134/UC969//Madera/UC937	UCD13-040-0UCD-0UCD-0MR-0MR-3MR-0MR	Food&Fodder	6R	7598	Naked, GY, MR to SFNB, Wadapt, TKW
23	Tamalpais//UC969 /Madera-UC937	UCD13-062-0UCD-0UCD-0MR-0MR-2MR-0MR	Food&Fodder	6R	7614	Naked, GY, Wadapt, TKW, MR to LR, MR to NFNB, MR to SFNB
24	N12051 F3 13/030026	H00008004/CDC MCGWIRE-0MR-0MR-4MR-0MR	Food&Fodder	2R	7615	Naked, GY, Wadapt,, TKW, MR to SFNB

GY: High grain yield; Wadapt: Wide adaptation; CT: Cold tolerance; H&D: Heat and drought tolerant, StrawY: High straw yield; TKW: Grain weight>40mg, LR: Leaf rust; NFNB: Net form of net blotch; SFNB: Spot form of net blotch.

Table 2. 2022 International Barley Yield Trial for Feed Forage and Malt for Favorable Environments (22-IBYT-FFM)

Entry	Pedigree	Selection History	MPP	RT	Germplasm Id	Traits
1	Local Check	Check				
2	Atahualpa//MSEL/LOGAN-BAR	HIICB12-396-0TR-0MR-0MR-0MR-4MR	Malt&Fodder	2R	7063	StrawY, MaltQ, TKW, MR to SFNB
3	DATCHA/3/MSEL/ND19098-1//CANELA	ICM1213CJ26-35CJ-010CH-05CJ-1CH-0MR	Malt&Fodder	2R	7131	GY, Wadapt, TKW, MaltQ, MR to SFNB
4	LIMON/BICHY2000/4/ALELI/3/ARUPO/K8755//MORA/5/MSEL/6/ Sebastian	HIICB12-190-0TR-0MR-0MR-0MR-3MR	Feed&Forage	2R	7089	GY, MR to LR, MR to SFNB
5	LOGAN-BAR/MSEL//AZAF/3/BRS195/ND19098-1	HIICB12-039-0TR-0TR-0MR-0MR-9MR	Feed&Forage	2R	7206	StrawY, MR to LR, MR to SFNB
6	MP103R/MP103MQ	UCD13-103-0UCD-0UCD-0MR-0MR-7MR	Feed&Forage	2R	7146	GY, StrawY, MR to SFNB
7	L94(Ryd3)//MSel/Butta12-96	UCD13-025-0MR-0MR-1MR	Feed&Forage	2R	7167	GY, StrawY, MR to LR, MR to SBNB
8	J12037 F3 13/030012	J02039005/MERIT 57-0MR-0MR-6MR	Feed&Forage	2R	7163	GY, StrawY, MR to SBNB
9	PFC9215/3/ZHEDAR#1/SHYRI//OLMO/4/Sebastian	HIICB12-257-0TR-0MR-0MR-0MR-3MR	Malt&Fodder	2R	7082	GY, StrawY, TKW, MaltQ, R to LR, MR to SFNB
10	Vmorales	Check		6R		
11	Sebastian//CONCHITA	HIICB12-143-0TR-0TR-0MR-0MR-7MR	Feed&Forage	2R	7071	GY, MR to LR, MR to NFNB, MR to SFNB
12	AZAF/SCARLETT//CONCHITA	HIICB12-200-0TR-0MR-0MR-0MR-3MR	Feed&Forage	2R	7134	GY, Wadapt, R to LR, MR to SFNB
13	MAGALY//Canela	HIICB12-072-0TR-0MR-0MR-0MR-2MR	Feed&Forage	2R	7083	GY, StrawY, MR to SFNB
14	PFC9215/3/ZHEDAR#1/SHYRI//OLMO/4/Sebastian	HIICB12-257-0TR-0MR-0MR-0MR-8MR	Malt&Fodder	2R	7141	GY, Wadapt, StrawY, TKW, MaltQ, MR to SFNB
15	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/GLORIA-BAR/COPAL//PM5/BEN/3/SEN/4/PETUNIA 1/5/PETUNIA 2//PENCO/CHEVRON-BAR/4/PETUNIA 2/3/CHAMICO/TOCTE//CONGONA	HIICB12-387-0TR-0MR-0MR-0MR-4MR	Feed&Forage	6R	6914	StrawY, MR to SFNB
16	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/BBSC/CONGONA/5/LEGACY/4/TOCTE//GOB/HUMAI10/3/ATAH92/ALELI	HIICB12-392-0TR-0MR-0MR-0MR-10MR	Feed&Forage	6R	6960	GY, StrawY, MR to LR, MR to NFNB, MR to SFNB
17	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA/7/ESMERALDA /3/SLLO/ROBUST//QUINA/4/M104	HIICB12-546-0TR-0MR-0MR-0MR-7MR	Feed&Forage	6R	6918	GY, StrawY, MR to NFNB, MR to SFNB
18	Doña Josefa/ND25160	RSI/ICJ11-12B111S-25CJ-05CH-05CJ-1CH-0CJ-0MR	Feed&Forage	6R	6938	GY, MR to NFNB, MR to SFNB
19	DOÑA JOSEFA/3/BREA/DL70//3*CABUYA	ICM13CH57-104CH-05CJ-010CH-0MR	Feed&Forage	6R	6901	GY, StrawY, R to LR, MR to SFNB
20	Rihane 03	Check		6R		
21	ATACO/BERMEJO//HIGO/3/CALI92/ROBUST/4/PETUNIA 1/5/PETUNIA 1/CHINIA/3/ATACO/BERMEJO//HIGO/6/ZIGZIG/3/M9846//CCXX14.ARZ3/PACO/7/ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104	HIICB12-528-0TR-0MR-0MR-0MR-8MR	Feed&Forage	6R	6905	GY, MR to LR, MR to SFNB
22	ATAHUALPA//M122	HIICB12-436-0TR-0TR-0MR-0MR-2MR	Feed&Forage	6R	6930	GY, MR to LR, MR to NFNB, MR to SFNB
23	T12107 F3 13/030070	J04079115/XENA-0MR-0MR-2MR	Feed&Forage	6R	6975	GY, Wadapt, StrawY, MR to SBNB
24	MADRE SELVA/3/BREA/DL70//3*TOCTE	ICM13CH7-6CH-05CJ-010CH-0MR	Feed&Forage	6R	7030	GY, Wadapt, StrawY, MR to LR, MR to SBNB

GY: High grain yield; Wadapt: Wide adaptation; MaltQ: Malt quality as obtained from micromalting process, StrawY: High straw yield; TKW: Grain weight>45mg and Caliber≥2.8 for 90% of the production, LR: Leaf rust; NFNB: Net form of net blotch; SFNB: Spot form of net blotch.

Table 3. The 2022 International Barley Observation Nursery (22-IBON)

Entry	Pedigree	Selection History	MPP	RT	Germ. ID
1	Local Check				
2	Soufara-02/3/RM1508/Por//WI2269/4/Hml-02/ArabiAbiad//ER/Apm/5/Soufara-02/3/RM1508/Por//WI2269/4/Hml-02/ArabiAbiad//ER/Apm	ICB10-1138-0AP-035AUB-020TR-3AUB-0MR	Feed4Drylands	2R	7514
3	CEV 96060//BUCK M8.88/E.ACACIA/3/CANELA/4/PFC8023/MSEL/5/PFC8023/MSEL	RSI/ICJ11-12B082S-21CJ-05CH-05CJ-9CH-0CJ-0MR	Feed4Drylands	2R	7523
4	CEV 96060//BUCK M8.88/E.ACACIA/3/CANELA/5/LIMON/BICHY2000/3/ALELI/CANELA//GOB96DH/4/ASAHI 5/2*ALELI	RSI/ICJ11-12B086S-57CJ-05CH-05CJ-1CH-0CJ-0MR	Feed4Drylands	2R	7427
5	4-1MBN11/3/BUCK M8.88/E.ACACIA//MSEL	RSI/ICJ11-12B198S-34CJ-05CH-05CJ-1CH-0CJ-0MR	Feed4Drylands	2R	7400
6	4-1MBN11/3/CANELA//E.ACACIA/DEFRA	RSI/ICJ11-12B202S-39CJ-05CH-05CJ-10CH-0CJ-0MR	Feed4Drylands	2R	7494
7	Msel/Orca//Z0550120/C7862	UCD13-112-0MR-0MR-5MR	Feed4Drylands	2R	7454
8	ZHANA/MADRE SELVA	ICM1213CJ4-46CJ-010CH-05CJ-8CH-0MR	Feed4Drylands	2R	7413
9	4-1MBN11/3/BUCK M8.88/E.ACACIA//MSEL	RSI/ICJ11-12B198S-45CJ-05CH-05CJ-1CH-0CJ-0MR	Feed4Drylands	2R	7426
10	Rihane 03				
11	MSEL/LOGAN-BAR//SHAKIRA	HIICB12-223-0TR-0MR-0MR-0MR-6MR	Feed4Drylands	2R	7509
12	Moroc9-75//WI2291/WI2269/3/Harmal	ICB10-1082-0AP-035AUB-020TR-2AUB-0MR	Feed4Drylands	2R	7410
13	Harmal//Sebastian	HIICB12-182-0TR-0TR-0MR-0MR-1MR	Feed4Drylands	2R	7442
14	SHAKIRA//Canela	HIICB12-076-0TR-0MR-0MR-0MR-4MR	Feed4Drylands	2R	7424
15	Mo.B1337/WI2291//Moroc9-75/3/Keel/4/Onslow/Tipper	ICB10-1162-0AP-035AUB-020TR-3AUB-0MR	Feed4Drylands	2R	7527
16	Atahualpa/3/80.5162/MSEL//GLORIA-BAR/IAR.H.485	HIICB12-411-0TR-0TR-0MR-0MR-3MR	Feed4Drylands	2R	7455
17	EFES28/4/Leb71/CBB37//Leb71/CBB29/3/Lignee527/Chn-01	ICB11-0253-0MC-0MC-0MC-2MR	Feed4Drylands	2R	7500
18	Rhn-03/Asse//RWA-M54/3/Saida/4/Rihane-03/3/As46/Aths*2//Aths/Lignee686	ICB10-0278-0AP-025AUB-015TR-2AUB-0MR	Feed4Drylands	6R	7354
19	Gloria'S'/Copal'S'//As46/Aths/3/Rhn-03/6/Rhn-03/Eldorado/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda	ICB11-0165-0MC-0MC-0MC-8MR	Feed4Drylands	6R	7289
20	Furat 03				
21	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/M9846//CCXX14.ARZ3/PACO/3/PALTON/7/PFC9214//PENCO/CHEVRON-BAR	HIICB12-523-0TR-0MR-0MR-0MR-8MR	Feed4Drylands	6R	7361
22	Carbo/Hamra/4/Rhn-08/3/DeirAlla106//DL71/Strain205/5/QB813-2/5/Aths/Lignee686/4/Rhn-03/3/Bc/Rhn//Ky63-1294	ICB09-0528-0AP-0AP-025AUB-3AUB-0MR	Feed4Drylands	6R	7246
23	Ishi//Morales/221BYT7	UCD13-070-0UCD-0UCD-0MR-0MR-9MR	Feed4Drylands	6R	7379
24	Doña Josefa/ND25160	RSI/ICJ11-12B111S-4CJ-05CH-05CJ-3CH-0CJ-0MR	Feed4Drylands	6R	7325
25	QB813-2/5/Aths/Lignee686/4/Rhn-03/3/Bc/Rhn//Ky63-1294/6/Gloria'S'/Copal'S'//As46/Aths/3/Rhn-03	ICB10-0210-0AP-025AUB-015TR-5AUB-0MR	Feed4Drylands	6R	7332
26	QB813-2/5/Aths/Lignee686/4/Rhn-03/3/Bc/Rhn//Ky63-1294/6/Rhn-03/Eldorado/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda	ICB10-0353-0AP-025AUB-015TR-4AUB-0MR	Feed4Drylands	6R	7319
27	Ishi//Morales/22nd IBYT7	UCD13-111-0MR-0MR-10MR	Feed4Drylands	6R	7244
28	SC 3883 K2/STANDER-BAR	ICM1213CJ34-32CJ-010CH-05CJ-5CH-0MR	Feed4Drylands	6R	7245
29	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/CIRU/5/LEGACY/4/TOCTE//GOB/HUMAI10/3/ATAH92/ALELI	HIICB12-393-0TR-0TR-0MR-0MR-6MR	Feed4Drylands	6R	7362
30	Vmorales				
31	H12009 F3 13/030986	H10012/H10035-0MR-0MR-1MR	Feed4Drylands	6R	7343
32	Carbo/Hamra/4/Rhn-08/3/DeirAlla106//DL71/Strain205/5/ICB_116132	ICB09-0517-0AP-0AP-025AUB-4AUB-0MR	Feed4Drylands	6R	7251
33	Rhn//Bc/Coho/3/DeirAlla106//Api/EB89-8-2-15-4/5/CM67/3/Apro//Sv02109/Mari/4/Carbo/6/Abay	ICB10-0086-0AP-025AUB-015TR-4AUB-0MR	Feed4Drylands	6R	7335
34	Chn-01/CC89//Arial/3/Lignee640/Bgs//Cel/4/Lignee527/Aths/5/Sawsan/Badia//Arar/3/Gloria'S'/Copal'S'	ICB10-0798-0AP-025AUB-015TR-2AUB-0MR	Feed4Drylands	6R	7283
35	Gloria'S'/Copal'S'//As46/Aths/3/Rhn-03/4/ALISO/CI3909-2//FALCON-BAR/3/HIGO	ICB11-0167-0MC-0MC-0MC-3MR	Feed4Drylands	6R	7274
36	Doña Josefa/STELLAR-ND	RSI/ICJ11-12B110S-7CJ-05CH-05CJ-10CH-0CJ-0MR	Feed4Drylands	6R	7369
37	Rhn-03/Eldorado/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda/6/ICB_119151	ICB09-0556-0AP-0AP-025AUB-4AUB-0MR	Feed4Drylands	6R	7317
38	Baca'S'/3/AC253//CI08887/CI05761/4/Cen/Bglo'S'/5/Hma-02//11012-2/CM67/3/Arar/4/IPA265	ICB09-0093-0AP-0AP-025AUB-2AUB-0MR	Feed4Drylands	6R	7249
39	UC933//Tamalpais/Rihane 03	UCD13-030-0MR-0MR-3MR	Feed4Drylands	6R	7256
40	Local Check				
41	Himblil/3/ATACO/COMINO//ALELI	ICB11-0089-0MC-0MC-0MC-1MR	Feed4Drylands	6R	7267
42	Rhn//Bc/Coho/3/DeirAlla106//Api/EB89-8-2-15-4/5/CM67/3/Apro//Sv02109/Mari/4/Carbo/6/ICB_116138	ICB10-0315-0AP-025AUB-015TR-5AUB-0MR	Feed4Drylands	6R	7336
43	Rhn-03/Eldorado/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda/6/Hma-02//11012-2/CM67/3/Alanda/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda	ICB10-0165-0AP-025AUB-015TR-2AUB-0MR	Feed4Drylands	6R	7264
44	UC1135//UC1134/Lacey	UCD13-079-0UCD-0UCD-0MR-0MR-2MR	Food&Forage	6R	7627
45	WOCUS71/UNKNOWN	UCD13-127-0UCD-0UCD-0MR-0MR-9MR	Food&Forage	6R	7616
46	Tamalpais//UC969 /Madera-UC937	UCD13-062-0UCD-0UCD-0MR-0MR-4MR	Food&Forage	6R	7613
47	WI3167/4/ALISO/CI3909-2//HB602/3/MOLA/SHYRI//ARUPO*2/JET/5/NB1054/Aleli//Gairdnaer	ICB10-0598-0AP-020TR-5AREC-0TR	Food&Forage	2R	4427
48	Aths/Lignee686//Orge905/Cr289-53-2/3/PETUNIA2/4/Ssn/Badia//Arar/3/Gloria'S'/Copal'S'	ICB06-1272-13AP-0AP-0TR-4AREC-0TR	Food&Forage	6R	4577
49	5054/UC1116//UC1134/Lacey	UCD13-047-0UCD-0UCD-0MR-0MR-2MR	Food&Forage	6R	7604
50	Rihane 03				
51	TAMALPAIS//MADERA/UC937-1	UCD011-0CD-0CD-0CD-0CD-0CD-0MR	Food&Forage	6R	6945
52	TAMALPAIS//MADERA/UC937-10	UCD011-0CD-0CD-0CD-0CD-0CD-0MR	Food&Forage	6R	6945
53	Xena//SHAKIRA	HIICB12-115-0TR-0MR-0MR-0MR-8MR	Feed&Forage	2R	7101
54	MARTHE//Canela	HIICB12-074-0TR-0MR-0MR-0MR-1MR	Feed&Forage	2R	7128
55	DATCHA//MSEL/ND21117	ICM1213CJ28-32CJ-010CH-05CJ-10CH-0MR	Feed&Forage	2R	7124
56	GRACE/3/PENCO/CHEVRON-BAR//ATAH92/GOB	ICM1213CJ15-74CJ-010CH-05CJ-8CH-0MR	Feed&Forage	2R	7072
57	DOÑA JOSEFA/3/NE167/CLE176//SCARLETT	ICM1314CJ1-12CJ-010CH-0MR	Feed&Forage	2R	7109

58	SVANHALS-BAR/MSEL//AZAF/GOB24DH/3/NE167/CLE176/4/BRS195/ND19098-1	HIICB12-454-0TR-0MR-0MR-0MR-7MR	Feed&Forage	2R	7090
59	MP103R/MP103MQ	UCD13-098-0UCD-0UCD-0MR-0MR-5MR	Feed&Forage	2R	7168
60	Furat 03				
61	MADRE SELVA/7/STANDER-BAR/API/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1	ICM13CH18-64CH-05CJ-010CH-0MR	Feed&Forage	2R	7175
62	LOGAN-BAR/MSEL//AZAF/3/NACKTA/HJA A33//FNC1	HIICB12-051-0TR-0MR-0MR-0MR-9MR	Feed&Forage	2R	7190
63	LOGAN-BAR/MSEL//AZAF/4/PFC9215/3/ZHEDAR#1/SHYRI//OLMO	HIICB12-043-0TR-0MR-0MR-0MR-4MR	Feed&Forage	2R	7220
64	Akrash//WI2291/WI2269/3/WI2291/WI2269//WI2291/Bgs/4/Clipper//WI2291*2/WI2269	ICB10-0988-0AP-035AUB-020TR-3AUB-0MR	Feed&Forage	2R	7075
65	SIMBA//CONCHITA	HIICB12-119-0TR-0MR-0MR-0MR-2MR	Feed&Forage	2R	7104
66	MAGALY//Sebastian	HIICB12-170-0TR-0MR-0MR-0MR-9MR	Feed&Forage	2R	7182
67	DOÑA JOSEFA/4/PFC9202//CLE150/W89.11369/3/CANELA	ICM13CH59-8CH-05CJ-010CH-0MR	Feed&Forage	6R	6957
68	PETUNIA 2/M111//M122	HIICB12-505-0TR-0MR-0MR-0MR-2MR	Feed&Forage	6R	7003
69	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA/8/M122	HIICB12-271-0TR-0MR-0MR-0MR-2MR	Feed&Forage	6R	6912
70	Vmorales				
71	DOÑA JOSEFA/3/BREA/DL70//3*CABUYA	ICM13CH57-65CH-05CJ-010CH-0MR	Feed&Forage	6R	7042
72	Ishi//Morales/221BYT7	UCD13-074-0UCD-0UCD-0MR-0MR-8MR	Feed&Forage	6R	6892
73	ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104/4/PETUNIA 2/M111	HIICB12-282-0TR-0MR-0MR-0MR-4MR	Feed&Forage	6R	6935
74	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/CARDO/BRS180	HIICB12-382-0TR-0TR-0MR-0MR-8MR	Feed&Forage	6R	6953
75	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/M9846//CCXX14.ARZ3/PACO/3/PALTON/6/ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104	HIICB12-545-0TR-0MR-0MR-0MR-7MR	Feed&Forage	6R	7019
76	ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104/4/PETUNIA 2/M111	HIICB12-282-0TR-0MR-0MR-0MR-2MR	Feed&Forage	6R	6979
77	BREA/DL70//CABUYA/7/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/BRS180	IBM12CH91-12CH-05CJ-010CH-2CJ-0CH-0MR	Feed&Forage	6R	6911
78	Ishi *2/Giza 132	UCD13-065-0UCD-0UCD-0MR-0MR-7MR	Feed&Forage	6R	7046
79	T12107 F3 13/030070	J04079115/XENA-0MR-0MR-5MR	Feed&Forage	6R	7026
80	Local Check				
81	BREA/DL70//3*TOCTE/3/LEGACY	IBM12CH48-3CH-05CJ-010CH-10CJ-0CH-0MR	Feed&Forage	6R	6996
82	Gize 132/2* Ishi	UCD13-021-0UCD-0UCD-0MR-0MR-2MR	Feed&Forage	6R	6927
83	TRADITION/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/7/LEGACY//PENCO/CHEVRON-BAR/8/M122	HIICB12-490-0TR-0MR-0MR-0MR-9MR	Feed&Forage	6R	7048
84	CLI18/E.QUEBRANCHO//E.QUEBRANCHO/NCL95109/3/CANELA/4/13-1MBN11	IBM12CH152-6CH-05CJ-010CH-2CJ-0CH-0MR	Feed&Forage	2R	7070
85	BBSC/CONGONA/5/LEGACY/4/TOCTE//GOB/HUMAI10/3/ATAH92/ALELI/6/PFC9214//PENCO/CHEVRON-BAR	HIICB12-518-0TR-0TR-0MR-0MR-6MR	Feed&Forage	2R	7095
86	MQ103MQ/MP179	UCD13-114-0UCD-0UCD-0MR-0MR-2MR	Feed&Forage	2R	7158
87	MERIT,B/AF9216//CANELA/3/PFC9214//PENCO/CHEVRON-BAR	HIICB12-583-0TR-0MR-0MR-0MR-2MR	Feed&Forage	2R	7160
88	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/GLORIA-BAR/COPAL//PM5/BEN/3/SEN/4/PETUNIA 1/5/PETUNIA 2//PENCO/CHEVRON-BAR/4/PETUNIA 2/3/CHAMICO/TOCTE//CONGONA	HIICB12-387-0TR-0MR-0MR-0MR-2MR	Feed&Forage	6R	6961
89	DOÑA JOSEFA/4/PFC9202//CLE150/W89.11369/3/CANELA	ICM13CH59-102CH-05CJ-010CH-0MR	Feed&Forage	6R	7005
90	Rihane 03				
91	ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104/7/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA	HIICB12-279-0TR-0MR-0MR-0MR-4MR	Feed&Forage	6R	7000
92	SARA1-BAR/CAPUCHONA 20/5/ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104	HIICB12-548-0TR-0MR-0MR-0MR-3MR	Feed&Forage	6R	6940
93	ATACO/BERMEJO//HIGO/3/CALI92/ROBUST/4/PETUNIA 1/5/PETUNIA 1/CHINIA/3/ATACO/BERMEJO//HIGO/6/ZIGZIG/3/M9846//CCXX14.ARZ3/PACO/6/SARA1-BAR/CAPUCHONA 20	HIICB12-299-0TR-0MR-0MR-0MR-5MR	Feed&Forage	6R	6909
94	DATCHA//MSEL/ND21117	ICM1213CJ28-14CJ-010CH-05CJ-8CH-0MR	Malt&Fodder	2R	7203
95	PFC9214//PENCO/CHEVRON-BAR/5/ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104	HIICB12-542-0TR-0TR-0MR-0MR-4MR	Malt&Fodder	2R	7080
96	LOGAN-BAR/MSEL//AZAF/3/BICHY2000//GOB/HUMAI10	HIICB12-046-0TR-0MR-0MR-0MR-7MR	Malt&Fodder	2R	7169
97	LOGAN-BAR/MSEL//AZAF/6/CABUYA/MJA//PETUNIA 1/5/PENCO/CHEVRON-BAR/3/ATACO/BERMEJO//HIGO/4/PETUNIA 1	HIICB12-047-0TR-0MR-0MR-0MR-2MR	Malt&Fodder	2R	7064
98	DATCHA/3/MSEL/ND19098-1//CANELA	ICM1213CJ26-22CJ-010CH-05CJ-4CH-0MR	Malt&Fodder	2R	7217
99	MSEL/LA MOLINA 95//SHAKIRA	HIICB12-226-0TR-0MR-0MR-0MR-8MR	Malt&Fodder	2R	7202
100	Furat 03				
101	Harmal//Canela	HIICB12-084-0TR-0TR-0MR-0MR-9MR	Malt&Fodder	2R	7076
102	MERIT,B/AF9216//CANELA/3/SHENMAI NO.3/MSEL	HIICB12-473-0TR-0MR-0MR-0MR-4MR	Malt&Fodder	2R	7201
103	DOÑA JOSEFA/3/MSEL//PERLE/BOWMAN	ICM13CH45-60CH-05CJ-010CH-0MR	Malt&Fodder	2R	7161
104	DATCHA/3/MSEL/ND19098-1//CANELA	ICM1213CJ26-5CJ-010CH-05CJ-8CH-0MR	Malt&Fodder	2R	7195
105	Clipper//WI2291*2/WI2269/3/Nawair 1	ICB09-0835-0AP-0AP-035AUB-2AUB-0MR	Malt&Fodder	2R	7488
106	Melusine/Aleli/3/Matico/Jet//Shyri/4/Canela/5/MADRE SELVA	ICB09-1942-0AP-0AP-035AUB-2AUB-0MR	Malt&Fodder	2R	7445
107	ZHANA/MADRE SELVA	ICM1213CJ4-16CJ-010CH-05CJ-7CH-0MR	Malt&Fodder	2R	7491
108	ATACO/BERMEJO//HIGO/3/CALI92/ROBUST/4/PETUNIA 1/5/PETUNIA 1/CHINIA/3/ATACO/BERMEJO//HIGO/6/ZIGZIG/3/M9846//CCXX14.ARZ3/PACO/6/PETUNIA 2/M111	HIICB12-300-0TR-0TR-0MR-0MR-4MR	Malt&Fodder	2R	7535
109	Canela//Sebastian	HIICB12-181-0TR-0MR-0MR-0MR-3MR	Malt&Fodder	2R	7460
110	Vmorales				
111	UC1261//UC1116/Rihane	UCD13-082-0UCD-0UCD-0MR-0MR-3MR	Malt&Fodder	6R	6933
112	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/GLORIA-BAR/COPAL//PM5/BEN/3/SEN/4/PETUNIA 1/5/PETUNIA 2//PENCO/CHEVRON-BAR/4/PETUNIA 2/3/CHAMICO/TOCTE//CONGONA	HIICB12-387-0TR-0TR-0MR-0MR-3MR	Malt&Fodder	6R	6939