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Dual-purpose barley genotypes for North Africa region – 2021 Report

Miguel Sanchez-Garcia

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Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

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Introduction

In the Drylands of the Middle East and North Africa (MENA) region, integrated crop and livestock farming is the predominant system. Traditional small-scale farmers need to maximize the productivity of their farms while coping with drought, heat, pests and diseases under a Climate Change scenario that affects them particularly. For these famers, cereal forages, stubble and straw are the main feed source for small ruminants during summer and winter seasons (Ryan et al., 2008) and with fodder and forage prices increasing (FAO 2018), breeding and growing cereals targeting more than just grain yield is a necessity. In this scenario, barley can be considered the perfect crop to increase food and feed security by intensifying animal and crop production per unit area in a context where arable land is limited. Strategies such as dual-purpose are particularly profitable for barley, that produces higher forage dry matter with lower yield and straw penalty. The combination of barley forage, straw and grain profits can be 12% superior to those of other cereals and to strategies were only grain is targeted in regional environments with more than 300mm (Ates et al., 2018). Recent studies have shown that the ICARDA Global Barley Breeding Program was able to develop new dual-purpose barley genotypes that produce up to 30% more forage than the best commercial checks (Verma 2019; Sanchez-Garcia 2021). Although these lines suffered yield and straw production penalties due to the dual-purpose management that hindered the system's profitability due to the typical drought and scatter rainfall pattern of the Mediterranean areas, elite lines with superior forage production and limited (8%) yield penalty could be found. In the present study we aim to test a set of 37 elite ICARDA barley genotypes and 3 commercial checks including 9 lines selected in past years for their superior forage production and regeneration capacity in the field in Morocco under simulated grazing and conventional conditions to determine their forage production, yield and biomass regeneration capacity and straw quality.

Experimental set-up

A set of 37 elite ICARDA barley genotypes and 3 commercial checks was assembled and tested in the field in Morocco under simulated grazing and conventional conditions in the 2020/21 cropping season. Of the 37 lines, 9 (Supplementary Table 1) were selected based on forage production and regeneration capacity from a similar experiment carried out in the 2019/20 and 2020/21 seasons (Verma 2020, Sanchez-Garcia 2021). The remaining 28 were new elite lines selected based on yield and biomass production obtained in yield trials performed in Morocco, Lebanon and India during the 2019/20 season and on early ground coverage assessed using the low-cost mobile phone-based CANOPEO App in Morocco.

The set was evaluated in a field trial consisting in a replicated Alpha-Lattice design with 80 plots 5 m-long, 6 rows and 20cm between rows. Fifty days after emergence, each plot was divided in 2 sub-plots of 2.5 m-long and a simulated grazing treatment was applied to one sub-plot per plot. The treatment consisted in cutting the aboveground biomass (leaves and shoots) ca. 5cm above the ground level (Figure 1). The fresh samples are then weighed and a subsample of each is dried in an air-oven at 70^{o}C for 2 days to determine the moisture content and the dry weight of the green cuts. Irrigation was applied as needed to supplement the 332mm received during the season.

Figure 1 Green cuts treatment performed in a field trial carried out in Marchouch (Morocco) in the 2019/20 season (top picture). Regenerating barley after green cut treatment (bottom picture).

Heading date and maturity date were collected from all plots, cut and control, as the date when 50% of the spikes were out the shoot (Zadoks 55) and the date when 50% of the peduncles turned yellow (Zadoks 87). Finally, the plots were harvested at ripening and grain and biomass yield were determined. The set was also scored for diseases present under natural infection, particularly Net Form of Net Blotch and Spot Form of Net Blotch.

Straw samples from all the plots were collected and transferred to the ICARDA-Rabat quality laboratory to determine feed quality. The samples were dried, grinded and analyzed with near-Infrared spectroscopy in a FOSS DS2500 NIRS (FOSS, Denmark) calibrated for feed quality traits in collaboration with ILRI feed quality laboratory (ILRI; Kenya). Thus, crude protein (CP, %), acid detergent fiber (ADF, %), acid detergent lignin (ADL, %), neutral detergent fiber (NDF, %) were obtained. Cellulose and Hemicellulose were calculated as ADF−ADL and NDF−ADF respectively.

All analysis were performed using Genstat v21 (VSN International 2020) and *R* software (R Core Team 2020) packages *statgenSTA* (van Rossum 2020a) and *statgenGxE* (van Rossum 2020b).

Forage production

The results of the cutting treatment showed significant differences between the lines in forage production (p<0.01; h^2= 0.78). Up to 27 testing lines produced more forage than the best check Rihane-03 (Figure 2) and the three best lines produced 43 to 57% more (P<0.05). Of the best 10 forage producing lines, only one was among the lines identified in 2020 under dual-purpose management (Sanchez-Garcia 2021), while

23 of the best 27 lines, including the best 9, were tested under dual purpose management for the first time.

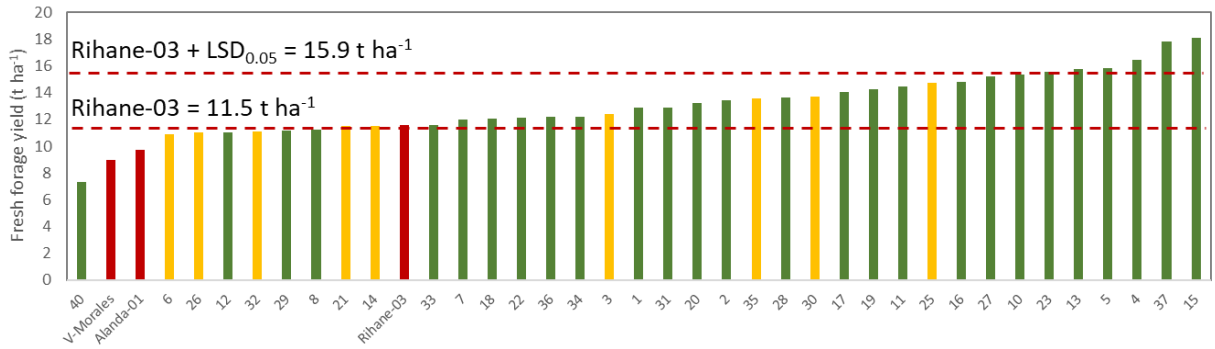

Figure 2 Forage yield of 37 ICARDA elite barley lines and 3 checks obtained from a cutting treatment in a field trial carried out in Marchouch (Morocco) in the 2020/21 cropping season. The yellow bars represent the lines selected in a dual-purpose trial in 2020, the green bars represent the new lines selected from the Feed and Forage MegaProduct Lines of the Global Barley Breeding Program and the red bars represent commercial checks. The brown line represents the forage yield of the best commercial check Rihane-03 (11.5 t/ha) and the red lines represents the forage yield of Rihane-03 plus the $LSD_{0.05}$.

Forage production for grazing is directly related with the capacity of the plants to produce more early biomass faster. Therefore plants that have a faster cycle, that is that arrive to flowering stage rapidly, can produce more early biomass in less time than slower ones. However, this trait can be detrimental for final crop profitability (the sum of the forage, straw and grain production profits) if, as a result of extreme earliness, the genotypes flower outsided the optimal flowering period of a given environment. The results of the present study showed that forage yield and flowering time in the control plots were correlated and that early genotypes tended to produce more forage yield than later ones (R^2=0.24; Figure 3). However, except for genotype 37, the highest forage production genotypes flowered within the average flowering date of the trial (mean heading date ± $LSD_{0.05}$). This result is in line of the findings of a previous study carried out in the same location (Sanchez-Garcia 2021). In addition, no relationship could be found between plant height under control conditions and forage production, indicating that breeders can produce high forage yielding varieties irrespective of their final height.

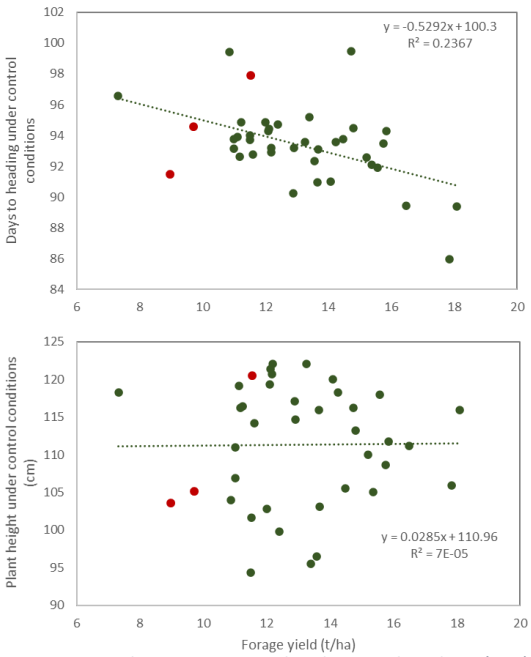

Figure 3 Biplot comparing the days to heading (top) and the plant heigh (bottom) under controlled conditions with the fresh forage production of 37 ICARDA elite barley lines and 3 checks obtained from a cutting treatment in a field trial carried out in Marchouch (Morocco) in the 2020/21 cropping season. Red dots represent the commercial checks

Feed and fodder production and regeneration

Dual-purpose barley management aims at providing farmers with green forage in winter while maximizing the grain and straw production of the crop at maturity. However, as a result of the grazing process, some varieties can express yield penalties due to a lower regeneration capacity. In the present study the dual-purpose management (cutting treatment) resulted in a biomass penalty of 12.3% (0.75 t/ha) while the average yield remained the same on average as compared to the control (Figure 5). The biomass penalty under dual-purpose management was smaller than the one observed in a previous study (Sanchez-Garcia 2021) while the absence of average yield penalty contrasts with the 37% penalty observed in 2020 (Sanchez-Garcia 2021). The possible explanation for this difference could rely on the lower grain and biomass average penalty of the new lines tested under dual-purpose management for the first time, specially regarding grain yield (Figure 6). Another possible explanation was the severe early season drought of the 2020 trial (Sanchez-Garcia 2021) that could have reduced the regeneration capacity of the lines in that year.

Contrary to the 2020 trial, no significant linear correlation was found between the forage production and the final grain and biomass yield neither under control or under dual-purpose management conditions (R^2<0.05 in all cases).

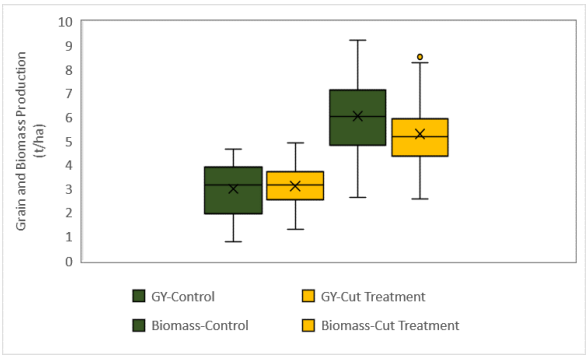

Figure 4 Box plot of the grain yield (left boxes) and biomass (right side boxes) production of 37 ICARDA elite barley lines and 3 checks tested in a field trial carried out in Marchouch (Morocco) under conventional (green) and dual-purpose managements (yellow) in the 2020/21 cropping season.

Combining feed quality and production

The feed quality of the straw harvested at the end of the cycle from each plot of the dual-purpose management was analyzed. The heritabilities ranged from 0.29 for ADL to 0.68 for Hemi-cellulose. The results showed that feed quality was independent from forage production or other variables analyzed (data not shown). Lines 2, 27 and 37 showed similar NDF and Cellulose values as the best check for the trait while all genotypes showed similar values of Hemi-cellulose as the best check for the trait (Table 1).

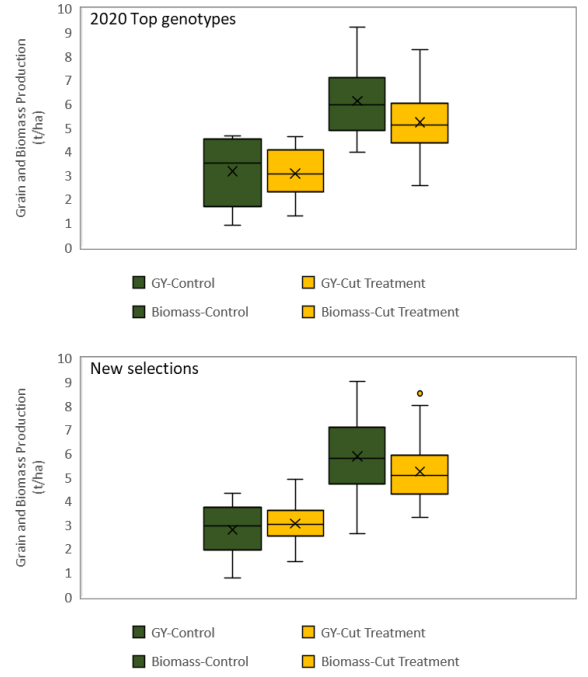

Figure 6 Box plot of the grain yield (left box pairs) and biomass (right side box pairs) production of 9 ICARDA elite barley lines selected under dual-purpose management in 2020 (Top graph) and 28 new ICARDA elite barley lines issued from the Feed and Forage MegaProduct Profile of the Global Barley Breeding Program (bottom graph) tested in a field trial carried out in Marchouch (Morocco) under conventional (green) and dual-purpose managements (yellow) in the 2020/21 cropping season.

Table 1. Selection of entries with appropriate forage production and/or regeneration capacity and straw quality

Entry	Pedigree	Fresh Forage t/ha	Grain yield under dual-purpose management t/ha	Biomass under dual-purpose management t/ha	CP %	NDF %	Cellulose %	Hemi-Cellulose %	Traits
15	Alanda/5/Aths/4/Pro/TolI//Cer*2/TolI/3/5106/6/Baca'S'/3/AC253//CI08887/CI05761/7/Alanda/5/Aths/4/Pro/TolI//Cer*2/TolI/3/5106/6/CalMr/CI16155	18.1	1.7	3.3	5.7	76.3	43.8	NA	High forage production and straw quality
5	SLB21-81/SLB22-74//Soffet no.9	15.9	4.9	8.5	4.3	75.6	44.5	23.6	High Yield High Forage Production
11	Aths/Lignee686/4/Avt/Attiki//Aths/3/Giza121/Pue/6/Lignee527/Chn-01//Alanda/5/Arizona5908/Aths//Avt/Attiki/3/S.T.Barley/4/Aths/Lignee686	14.5	4.1	6.5	4.4	76.3	45.5	23.2	High Yield High Forage Production
20	Arig8/Imperial//M7/3/Rt013/4/Alanda-01/5/Lignee527/NK1272//JLB70-063/3/IPA99	13.3	4.4	8.0	4.9	75.7	44.9	23.7	High Yield Good Regeneration and Forage production
27	H.spont.41-3/SLB34-40/7/Lignee527//Bahtim/DL71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69/6/Lignee527/Chn-01//Arar/Rhn-03	15.2	3.3	5.4	5.3	74.0	43.4	23.6	High Forage and Straw Quality and Regeneration
14	Rhn//Bc/Coho/3/DeirAlla106//Api/EB89-8-2-15-4/5/CM67/3/Apro//Sv02109/Mari/4/Carbo/6/IPA7	11.5	3.9	5.6	4.5	77.2	45.5	24.0	Good Regeneration Average Forage
2	UC1118 // UC1116 / YUMA	13.4	3.8	6.2	5.3	74.3	43.2	24.5	Good Regeneration and straw quality and yield
1	X // INDIAN BBARLEY/3*NK 1272	12.9	3.8	5.8	5.4	75.9	44.3	23.9	Good Regeneration
13	As57/DL530//Alanda-01/4/Lignee527/Chn-01//Alanda/3/As57/Kc	15.8	2.9	5.0	5.1	75.6	44.2	24.3	Good Forage Production
37	Alanda-01/4/SICB-105935/3/Hma-02//11012-2/CM67/5/Aths/Lignee686/3/Nacha2//Lignee640/Hma-01	17.8	2.4	4.3	5.2	74.4	43.6	23.6	High Forage Production and straw quality
30	DOÑA JOSEFA/3/BREA/DL70//3*CABUYA	13.7	4.3	6.5	4.7	74.5	44.2	23.3	Average Forage Production and good regeneration capacity and straw quality
Check1	Rihane-03	11.5	3.5	5.9	5.2	75.2	44.6	23.5	
Check2	Alanda01	9.7	3.9	6.5		71.2	41.9	23.1	
Check3	V-Morales	9.0	3.4	5.4	5.7	73.7	43.1	23.5	
	h2	0.78	0.38	0.65	0.63	0.30	0.40	0.38	
	$LSD_{0.05}$	4.39	1.76	2.60	1.02	3.07	1.06	2.08	

Conclusions

In the Drylands of the Middle East and North Africa, integrated crop and livestock farming is the predominant system where small-scale farmers struggle to maximize the productivity of their farms under Climate Change. For these famers, cereal forages, stubble, and straw are the main feed source for small ruminants during summer and winter (Ryan et al., 2008), and with rising fodder and forage prices (FAO 2018), breeding and growing cereals that target more than just grain yield becomes a necessity. In this scenario, barley is the perfect crop to increase food and feed security by maximizing the crop-livestock farming system's efficiency and resilience. Barley dual-purpose strategy contribute to this by producing higher green forage dry matter in winter - when forage is scarce - with limited grain and fodder yield penalty in summer. This and ensures fodder availability all year around reducing the pressure over rangelands In the present study a series of elite barley lines were tested under this management to evaluate their forage production, regeneration capacity and feed quality. The results showed that up to 57% more forage production can be achieved with the new elite barley genotypes as compared with the commercial checks. A previous study carried in the same location in 2019/20 showed negative correlation between forage production and grain and biomass (Sanchez-Garcia 2021). However, in the present study genotypes combining high forage production with superior grain and straw yields in summer were identified. Lines such as n5 (SLB21-81/SLB22-74//Soffet no.9) showed 37% more forage production while producing 27 and 30% more grain and biomass yield under dual purpose management than the best check. The difference between the results in 2020 and 2021 could be due to the severe drought (less than 250mm during the cropping cycle) that occurred in Morocco in 2020 that indered the regeneration process. These results are in line with the findings of Ates et al. (2018) that showed that dual purpose strategy can be more economically profitable than targeting only grain, in areas with >300mm of rain while below that rainfall the profitability can be reduced.

The high forage production lines could be useful also in other agronomic strategies besides dual-purpose. For instance, for hydroponic forage production. Lines such as n37 and specially n15 produced 54 and 57% more forage than the best check Rihane-03 respectively and n15 also showed good straw quality.

In general, the commercial checks showed higher straw quality than the elite genotypes tested. However, lines such as n2 or n30 combined superior forage, grain and biomass production and similar straw quality than the checks.

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Supplementary Table 1: Elite barley lines tested under conventional and dual-purpose management in a field trial in Marchouch (Morocco) in the 2020/21 cropping season. The lines are issued from 2020 selection under dual purpose management (2020 DP Sel) and from the Feed and Forage Mega Product Profile of the Global Barley Breeding Program in 2021 (21 Feed&Forage MPP)

Entry	Cross name	Sel. History	Origin
1	X // INDIAN BBARLEY/3*NK 1272	UCD013-009-0CD-0CD-0CD-0MR-4MR	21 Feed&Forage MPP
2	UC1118 // UC1116 / YUMA	UCD013-047-0CD-0CD-0CD-0MR-8MR	21 Feed&Forage MPP
3	SC 3883 K2/STANDER-BAR	ICM1213CJ34-32CJ-010CH-05CJ-5CH-0MR	2020 DP Sel
4	Alanda/5/Aths/4/Pro/Toll//Cer*2/Toll/3/5106/6/AwBlack/Aths//Arar/3/9Cr279-07/Roho/7/Atahualpa/8/IPA7/4/AwBlack/Aths//Arar/3/9Cr279-07/Roho/5/Rhn-03//Lignee527/As45	SICB12-0068-0TR-0TR-025KF-015AREC-2AREC-0KF	21 Feed&Forage MPP
5	SLB21-81/SLB22-74//Soffet no.9	SICB12-0595-0TR-0TR-025KF-015AREC-5AREC-0KF	21 Feed&Forage MPP
6	UC1266//SuNu/Ishi	UCD13-094-0UCD-0UCD-0MR-0MR-6MR	2020 DP Sel
7	Hma-02//11012-2/CM67/3/Alanda/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda/6/Rhn-03/Eldorado/5/Rhn-03//Lignee527/NK1272/4/Lignee527/Chn-01/3/Alanda	ICB11-0183-0AP-030AREC-015TR-015AREC-3AREC-0KF	21 Feed&Forage MPP
8	Tadmor//Roho/Mazurka/3/Tadmor/5/Arig8/Imperial//M7/3/Rt013/4/Martin	SICB12-0607-0TR-0TR-025KF-015AREC-4AREC-0KF	21 Feed&Forage MPP
9	Rihane03	Check	Check
10	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/BRS180/7/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/CIRU	ICM14CH123-30CH-0CH-0CH-0MR-5MR	21 Feed&Forage MPP
11	Aths/Lignee686/4/Avt/Attiki//Aths/3/Giza121/Pue/6/Lignee527/Chn-01//Alanda/5/Arizona5908/Aths//Avt/Attiki/3/S.T.Barley/4/Aths/Lignee686	SICB12-0429-0TR-0TR-025KF-015AREC-5AREC-0KF	21 Feed&Forage MPP
12	Una80/IPA7	SICB12-0731-0TR-0TR-025KF-015AREC-4AREC-0KF	21 Feed&Forage MPP
13	As57/DL530//Alanda-01/4/Lignee527/Chn-01//Alanda/3/As57/Kc	SICB12-0420-0TR-0TR-025KF-015AREC-5AREC-0KF	21 Feed&Forage MPP
14	Rhn//Bc/Coho/3/DeirAlla106//Api/EB89-8-2-15-4/5/CM67/3/Apro//Sv02109/Mari/4/Carbo/6/IPA7	ICB08-0294-17AP-0AP-025AP-5AUB-0KF	2020 DP Sel
15	Alanda/5/Aths/4/Pro/Toll//Cer*2/Toll/3/5106/6/Baca'S'/3/AC253//CI08887/CI05761/7/Alanda/5/Aths/4/Pro/Toll//Cer*2/Toll/3/5106/6/CalMr/CI16155	SICB12-0539-0TR-0TR-025KF-015AREC-4AREC-0KF	21 Feed&Forage MPP
16	Lignee527/Chn-01//Alanda/3/As57/Kc/6/Lignee527/Chn-01//Alanda/5/Arizona5908/Aths//Avt/Attiki/3/S.T.Barley/4/Aths/Lignee686	SICB12-0451-0TR-0TR-025KF-015AREC-4AREC-0KF	21 Feed&Forage MPP
17	QB813-2/5/Aths/Lignee686/4/Rhn-03/3/Bc/Rhn//Ky63-1294/7/Rhn-03/3/Mr25-84/Att//Mari/Aths*3-02/6/Lignee527//Bahtim/DL71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69	SICB12-0176-0TR-0TR-025KF-015AREC-2AREC-0KF	21 Feed&Forage MPP
18	Lignee527//Bahtim/DL71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69/6/Lignee527/Chn-01//Arar/Rhn-03/7/Rum/4/Rhn-03/3/Mr25-84/Att//Mari/Aths*3-02	SICB12-0390-0TR-0TR-025KF-015AREC-1AREC-0KF	21 Feed&Forage MPP
19	Lignee527/NK1272//JLB70-063/3/IPA99/5/Arig8/Imperial//M7/3/Rt013/4/Alanda-01	SICB12-0621-0TR-0TR-025KF-015AREC-1AREC-0KF	21 Feed&Forage MPP
20	Arig8/Imperial//M7/3/Rt013/4/Alanda-01/5/Lignee527/NK1272//JLB70-063/3/IPA99	SICB12-0613-0TR-0TR-025KF-015AREC-1AREC-0KF	21 Feed&Forage MPP
21	MADRE SELVA/3/BREA/DL70//3*TOCTE	ICM13CH7-6CH-05CJ-010CH-0MR	2020 DP Sel
22	Lignee527//Bahtim/DL71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69/6/Lignee527/Chn-01//Arar/Rhn-03/7/Rihane-03/3/As46/Aths*2//Aths/Lignee686/4/Alanda-01	SICB12-0388-0TR-0TR-025KF-015AREC-5AREC-0KF	21 Feed&Forage MPP
23	Zanbaka/H.spont.41-2/4/Arar/H.spont.19-15//Hml/3/H.spont.41-1/Tadmor/5/Zanbakian/6/WI2291/3/CI03309/Attiki//Hja33/4/Gustoe/5/Arar/H.spont.19-15//Hml/3/H.spont.41-1/Tadmor	SICB12-0385-0TR-0TR-025KF-015AREC-3AREC-0KF	21 Feed&Forage MPP
24	Zanbaka/H.spont.41-2/4/Arar/H.spont.19-15//Hml/3/H.spont.41-1/Tadmor/5/Zanbakian/7/Lignee527//Bahtim/DL71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69/6/Lignee527/Chn-01//Arar/Rhn-03	SICB12-0382-0TR-0TR-05KF-015AREC-5AREC-0KF	21 Feed&Forage MPP
25	Ishi//Rihane/221BYT7	UCD13-032-0UCD-0UCD-0MR-0MR-10MR	2020 DP Sel
26	Doña Josefa/3-1MBN11	RSI/ICJ11-12B107S-2CJ-05CH-05CJ-1CH-0CJ-0MR	2020 DP Sel
27	H.spont.41-3/SLB34-40/7/Lignee527//Bahtim/DL71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69/6/Lignee527/Chn-01//Arar/Rhn-03	SICB12-0363-0TR-0TR-025KF-015AREC-3AREC-0KF	21 Feed&Forage MPP
28	Alanda-01//Gerbel/Hma/5/Chn-01/3/Arizona5908/Aths//Bgs/4/Lignee640/Bgs//Cel/6/Arig 8-1	SICB12-0555-0TR-0TR-025KF-015AREC-3AREC-0KF	21 Feed&Forage MPP
29	Alanda//Lignee527/Arar/6/Multan/M23/4/HopRo/3/Md/AT//CM/5/24569/7/U.Sask.1766/Api//Cel/3/Weeah/4/Arar/5/Aths	SICB12-0646-0TR-0TR-025KF-015AREC-2AREC-0KF	21 Feed&Forage MPP
30	DOÑA JOSEFA/3/BREA/DL70//3*CABUYA	ICM13CH57-104CH-05CJ-010CH-0MR	2020 DP Sel
31	Lignee527/Chn-01//Alanda/5/Arizona5908/Aths//Avt/Attiki/3/S.T.Barley/4/Aths/Lignee686/6/Aths/Lignee686/4/Avt/Attiki//Aths/3/Giza121/Pue	SICB12-0423-0TR-0TR-025KF-015AREC-1AREC-0KF	21 Feed&Forage MPP
32	Lignee527/NK1272//JLB70-063/3/Alanda/Zafraa//Gloria'S'/Copal'S'/4/Gloria'S'/Copal'S'//As46/Aths/3/Rhn-03	ICB10-0257-0AP-0AP-0MR-0MR	21 Feed&Forage MPP
33	ZACATECAS 4 (LEGACY/CHAMICO)/5/EXCEL-BAR/4/GLORIA-BAR/COME//LIGNEE640/3/S.P-B	ICM14CH143-10CH-0CH-0CH-0MR-6MR	2020 DP Sel
34	Rum/4/Rhn-03/3/Mr25-84/Att//Mari/Aths*3-02/6/Arig8/Imperial//M7/3/Rt013/5/Aths/Lignee686/3/DeirAlla106//Sv.Asa/Attiki/4/Cen/Bglo'S'	SICB12-0401-0TR-0TR-025KF-015AREC-2AREC-0KF	21 Feed&Forage MPP
35	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	21 Feed&Forage MPP
36	Lignee527/NK1272//JLB70-063/3/IPA99/5/Arig8/Imperial//M7/3/Rt013/4/Alanda-01	SICB12-0621-0TR-0TR-025KF-015AREC-4AREC-0KF	Check
37	Alanda-01/4/SICB-105935/3/Hma-02//11012-2/CM67/5/Aths/Lignee686/3/Nacha2//Lignee640/Hma-01	SICB12-0090-0TR-0TR-025KF-015AREC-5AREC-0KF	21 Feed&Forage MPP
38	Alanda01	Check	21 Feed&Forage MPP
39	V Morales	Check	21 Feed&Forage MPP
40	Rhn-03/3/Mr25-84/Att//Mari/Aths*3-02/4/Alanda-01/5/Rhn-03/3/Mr25-84/Att//Mari/Aths*3-02/4/Ssn/Badia//Arar/3/Gloria'S'/Copal'S'	SICB12-0209-0TR-0TR-025KF-015AREC-1AREC-0KF	21 Feed&Forage MPP