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Registration of Tagasaste (*Chamaecytisus palmensis*) Variety "Lattuu" for the Highland Areas of Ethiopia

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አህፅሮት

ከዚህ በፊት የተለቀቀውን ዝርያ (MoA) ጨምሮ አስራ አምስት የታጋሳስቴ ዝርያዎች ያላቸው የመኖ ምርት፣ የመኖ ጥራት፣ በሽታን የመቋቋምና ሌሎች ከምርታማነት ጋር የተያያዙ ባህሪያትን ለመገምገም የምርምር ስራው በሆለታና በጀልዱ የምርምር ጣቢያዎች ላይ ለአራት ዓመታት (2008-2011 እኤአ) ተካሄዶ ነበር፡፡ ከእነዚህ ዝርያዎች ውስጥ ሶስት የተሻሉ ዝርያዎች (CI-15052፣ CI-17497፣ እና CI-15039) ተመርጠው በሆለታ፣ በቁሉምሣና በጀልዱ የምርምር ጣቢያዎች ላይ እኤአ በ 2017 የማረጋገጫ ጥናት ተካሂዷል፡፡ ለቱ (CI-15052) ተብሎ የተለቀቀው አዲሱ የታጋሳስቴ ዝርያ ከፍተኛ የሆነ የሚበላ የመኖ ምርት (7.46 ቶን በሄክታር) ሲሰጥ CI-15039 የተባለው የታጋሳስቴ ዝርያ ደግሞ ዝቅተኛ (3.60 ቶን በሄክታር) የሚበላ የመኖ ምርት ሰጥቷል፡፡ ከዚህ በፊት የተለቀቀው የታጋሳስቴ ዝርያ (MoA) ከሌሎች እጩ ዝርያዎች ጋር ሲወዳደር በተቃራኒው ከፍተኛ የሆነ የማይበላ የመኖ ምርት (6.40 ቶን በሄክታር) ነበረው፡፡ ታጋሳስቴ የሚበላና (ቅጠልና የሚበላ ቅርንጫፍ) የማይበላ (ግንድ) የተክል ክፍል ያለው ሲሆን ለቱ ተብሎ የተለቀቀው ዝርያ በትክክለኛው ጊዜ ከታጨደ 61 ፐርሰንቱ የሚበላ ሲሆን 39 ፐርሰንቱ ግን የግንድ ክፍል ስለሆነ የማይበላ ነው፡፡ የተለቀቀው ለቱ ዝርያ 7.46 ቶን በሄክታር የሚበላ የመኖ ምርት፣ 1.64 ቶን በሄክታር የክሩድ ፕሮቲን ምርትና 3.99 ቶን በሄክታር የሚፈጭ የመኖ ምርት ሰጥቷል፡፡ ለቱ ዝርያ ከዚህ በፊት ከተለቀቀው ዝርያ ጋር ሲወዳደር 24.63 ፐርሰንት የክሩድ ፕሮቲን ምርትና 10.33 ፐርሰንት የሚፈጭ የመኖ ምርት ጭማሪ ነበረው፡፡ በአጠቃላይ የተለቀቀው ለቱ ዝርያ የተሻለ የሚበላ የተክል ክፍል፣ ክሩድ ፕሮቲን እና በእንስሳት ሆድ ውስጥ በተሻለ ሁኔታ የመፈጨት ባህሪያት ነበሩት፡፡ ስለዚህ በብሔራዊ የዝርያ አፅዳቂ ኮሚቴ ዝርያዎቹ ያላቸው የምርታማነት ሁኔታ እኤአ በ2017 በመስክ ላይ ከተገመገመ በኋላ እኤአ በሚያዝያ 2018 ለቱ የተባለው ዝርያ ለደጋማ አከባቢዎች እንዲለቀቅ የተወሰነ ሲሆን ዘሩን በሆለታ ግብርና ምርምር ማዕከል ይገኛል፡፡

Abstract

Fifteen tagasaste varieties including the standard check variety (MoA) were evaluated for forage dry matter yield, nutritional profiles, disease and insect pest reaction, and other agro-morphological characteristics at Holetta and Jeldu research sites during the main cropping seasons of 2008-2011. Based on the overall performance, three best performing varieties (CI-15052, CI-17497, and CI-15039) were selected and verified with the standard check at Holetta, and Kulumsa Agricultural Research Centers and Jeldu sub-site in 2017 cropping season. The overall mean result indicated that the released variety Lattuu (CI-15052) produced the highest edible yield (7.46 t/ha) while variety CI-15039 produced the lowest (3.60 t/ha) edible yield when compared with other varieties. On the other hand, the standard check variety (MoA) produced the highest (6.40 t/ha) inedible yield. The tagasaste varieties comprise edible (leaf and edible branch) and inedible (stem) plant parts; however, the share of the edible part (61%) of the released Lattuu variety was much higher than its inedible (39%) part of the plant. The total edible dry matter, crude protein, and digestible yields of the Lattuu variety were 7.46, 1.64, and 3.99 t/ha, respectively. Moreover, the released Lattuu variety had 24.63 and 10.33% CP yield and digestible yield advantages over the *standard check variety, respectively. Generally, the released Lattuu variety had relatively better leaf to stem ratio, CP, and IVOMD advantages over the standard check variety. Therefore, the national variety releasing committee evaluated the varieties at field conditions in October 2017 and variety Lattuu (CI-15052) was officially released in April 2018 for the highland areas and similar agro-ecologies of the country. The pre-basic and basic seeds of the released Lattuu variety are maintained by the feeds and nutrition research section of Holetta Agricultural Research Center.*

Keywords: tree lucerne, variety registration, variety release, variety verification, yield

Introduction

Tagasaste (*Chamaecytisus palmensis*) also known as tree lucerne is an evergreen, hardy leguminous shrub that originated in the Canary Islands (Borens and Poppi, 1990; Townsend and Radcliffe, 1990). The plant exhibits wide phenotypic variation in habit and vigor of growth, leaf size and pubescence, and flowering time (Frame, 2000; Cook *et al*., 2005). It is a very important forage tree in Australia and New Zealand that could also have a great potential to be widely adapted and utilized in the different agro-ecologies and farming systems in the African highlands, Latin America, and many other sub-tropical and temperate areas. It is also well adapted in the tropical highlands of Africa, like the Ethiopian highlands up to an altitude of 3000 meters above sea level (ICRAF, 2006; Getnet, 1998a). Tagasaste is well adapted to a wide temperature range and could survive under very cool temperatures and is resistant to light frost. It is susceptible to waterlogging and saline conditions but grows vigorously on well-drained soils and is tolerant of acidic soils in temperate areas (Hawley, 1984; Borens and Poppi, 1990). It is deep-rooted up to six meters and resistant to drought (Snook, 1982). Tagasaste can be established from cuttings, direct seeding, and transplanted seedlings (Snook, 1986). Tagasaste seed has a hard coat, which reduces germination to only 2 to 3% without any treatment. However, treating with boiling water for 7 to 9 minutes will increase the germination up to 71% (Getnet, 1998b). In the Ethiopian highlands, transplanting seedlings is a more popular way of establishing tagasaste than direct seeding (HRC, 1996).

Tagasaste is one of the recommended browse forage crops for the highland farming system in Ethiopia (EARO, 2000; Mengistu, 2006). It was introduced to Ethiopia in 1984 and well adapted in the highlands as a multipurpose tree by cultivating as a backyard crop and in integration with other food crops (Lazier 1987; Alemayehu, 1989; Getnet, 1991; Khsay, 1993). This fodder tree could be grown on conventional arable lands or in integration with soil conservation and different practices such as on soil bands, terraces, fence lines, alley cropping, and hedgerows in the farming system. Integrating fodder production of forage legumes can strengthen the sustainability of a farming system and makes agriculture friendly to the environment in countries like Ethiopia where cropland scarcity, feed shortage, and soil fertility problems are prevalent. Also, it serves to prevent soil erosion, is used for fuelwood, and lives to the fence. Tagasaste produces forage for livestock during the dry season when feed shortage is critical. Like other supplements, tagasaste provides critical nutrients lacking in the basal diet (Bonsi *et al.*, 1995). Annual biomass production of tagasaste was found substantially high (4.7-10 t/ha DM) with average crude protein (CP) content and *in-vitro* dry organic matter digestibility (IVDOMD) of tagasaste ranged from 18-21.2% and 65.3-70.5% on dry matter basis, respectively (Seyoum, 1995; Getnet, 1998a) depending on stages of harvest. Thus such leguminous trees can improve the utilization of low-quality roughages.

In the mixed crop-livestock systems of Ethiopia, the total feed resources available for livestock production come from permanent pasture, transient pastures between cropping cycles, crop residues, and crop aftermath. Feed supplies are constrained mainly by a shortage of grazing land, soil fertility, and unreliable seasonal rainfall in almost all areas. The availability of feed resources is characterized by the highly seasonal fluctuations in both quantity and quality including deficiencies of some minerals, like phosphorus, copper, and zinc. Low-quality roughages, which form the basal feeds in sub-Saharan Africa, are deficient in nitrogen, energy, vitamins, and minerals. These nutrient deficiencies affect microbial growth and fermentation in the rumen resulted in overall low animal productivity. Economic constraints in these countries have not encouraged farmers to use chemicals and industrial-based concentrates as supplements to improve the utilization of roughages. Hence multipurpose trees like tagasaste have a great role in improving the overall agricultural production systems and encourage the organic type of farming that is environmentally healthy. Accordingly, there is a need to evaluate and select the best performing tagasaste varieties to address the feed demand of mixed farming systems in the country. Therefore, this paper highlights the forage yield performance, herbage qualities, agro-ecological adaptation, reaction to major diseases and insect pests, and other morpho-agronomic and management recommendations for the recently developed and released tagasaste variety in Ethiopia.

Materials and Methods

Description of the study sites

The study was executed in the central highlands at Holetta and Kulumsa Agricultural Research Centers and Jeldu sub-site during the main cropping season of 2012-2017 under rainfed conditions. The rainfall of the study sites is bimodal and about 70% of the precipitation falls in the period from June to September, while the remaining 30% falls in the period from March to May. The trial sites' geographical position and physicochemical properties of the soil are summarized in Table 1.

Table 1. Description of the test locations for the geographical position and physicochemical properties of the soils

Parameters	Holetta	Jeldu	Kulumsa
Latitude	9° 00'N	09°16'N	08°05'N
Longitude	38° 30'E	38°05'E	39°10'E
Altitude (masl)	2400	2800	2200
Distance from Addis Ababa (km)	29	113	167
Annual Rainfall (mm)	1044	1200	820
Daily minimum temperature (°C)	6.2	2.1	10.5
Daily maximum temperature (°C)	21.2	16.9	22.8
Soil type	Nitosol	Humic Nitosol	Luvisol
Textural class	Clay	Clay loam	Clay loam
pH(1:1 H_2o)	5.24	-	6.0
Total organic matter (%)	1.80	-	5.50
Total nitrogen (%)	0.17	-	0.25
Available phosphorous (ppm)	4.55	-	-

Experimental materials, design, and layout

One hundred fifty tagasaste accessions of world collection were acquired from an international livestock research institute and screened for two cropping seasons at Holetta research center and the best performing fifteen accessions were selected and advanced for further evaluation at Holetta and Jeldu locations. Based on four years of agronomic and yield performance data and nutritive values, three promising varieties (CI-15052, CI-15039, and CI-17497) were selected to be verified for their better forage yield, agronomic performances, and nutritional qualities at Holetta, Jeldu, and Kulumsa research sites. Non replicated 10 m x 10 m plot size was used for verification of the performances of the varieties. Seedlings of the candidate varieties including the standard check variety (MoA) were raised at the nursery site of Holetta research center and then transplanted to the experimental fields during the main rainy season. The seedlings were planted in rows using the spacing of 50 cm between plants, 1 m between rows, and 1 m between plots. Diammonium phosphate (DAP) fertilizer at the rate of 100 kg/ha was applied during the transplanting of the seedlings to the experimental fields. All recommended agronomic practices were uniformly applied for all varieties during the experimental periods.

Data collection and sampling

Plant height was taken randomly from three plants in each plot and measured using a height meter from the ground level to the apex of the plant. For the determination of biomass yield, varieties were harvested at the forage harvesting stage. The weight of the total fresh biomass yield was recorded from each plot in the field and the estimated 500 g of their representative samples were taken from each plot to the laboratory. The estimated 500 g sample taken from each plot was weighed to know the total sample fresh weight using sensitive table balance and manually fractionated into leaf, edible branch, and stem. The morphological parts were separately weighed to know their sample fresh weight, oven-dried for 72 hours at a temperature of 65^oC, and separately weighed to estimate the proportions of these morphological parts. The proportion of each morphological fraction in percent was then computed as the ratio of each dry biomass fraction to total dry biomass multiplied by 100. The crude protein yield was calculated by multiplying crude protein content with edible biomass yield and then divided by 100%. The digestible yield was also determined by multiplying IVOMD with edible biomass yield and then divided by 100%. Data recording on major diseases and insect pests was done for all tagasaste varieties starting from preliminary observation to verification trial. Based on the standard rating scale of 1-9, where 1 is highly resistant and 9 highly susceptible, the candidate varieties were evaluated for their level of disease and insect pest resistance. Starting from initial screening to verification trial stages, no chemical was used to control the major disease and insect pests.

Laboratory analysis

The oven-dried samples were ground to pass a 1-mm sieve and used for laboratory analysis to determine the chemical composition and *in-vitro* organic matter digestibility of the varieties. Total ash content was determined by oven drying the samples at 105^0C overnight and by combusting the samples in a muffle furnace at 550^0C for 6 hours (AOAC, 1990). Nitrogen (N) content was determined following the micro-Kjeldahl digestion, distillation, and titration procedures (AOAC, 1995), and the crude protein (CP) content was estimated by multiplying the N content by 6.25. The structural plant constituents like neutral detergent fiber (NDF), acid detergent fiber (ADF), and acid detergent lignin (ADL) were determined according to Van Soest and Robertson procedure (1985). The *in-vitro* organic matter digestibility (IVOMD) was determined according to the Tilley and Terry procedure (1963).

Results and Discussion

Agro-morphological Characteristics

The National Variety Releasing Committee (NVRC) evaluated the varieties at field conditions in October 2017. According to their evaluation result, the best performing Lattuu (CI-15052) variety of tagasaste was officially released in April 2018 to be utilized by various end-users in the highland areas. The mean plant height of the candidate varieties with the standard check is summarized in Table 2.

The released Lattuu variety adapted and gave better yield in the highland areas ranging in altitude from 2400 to 3000 masl. The performance of the variety is promising in areas where an annual rainfall ranging from 1200 to 1500 mm. The variety produced better forage biomass yield and seed yield in most soil types except vertisol. Despite vertisol is very fertile, its productivity is highly constrained by unique soil physical properties. Due to the hard seed coat nature of tagasaste, the seeds should be treated in boiled water for 11 minutes before planting.

Planting can be done directly using seeds or seedlings. However, planting using seedlings gives better establishment results than direct seed sowing. Seedlings rising start from April at the nursery site and are transplanted to the field from mid-June to July. The seedlings should be planted in intra and inter-row spacing of 50 and 100 cm, respectively, giving a population density of 20,000 plants per hectare. The average plant survival percentage of the Lattuu variety is ranged from 75 to 85% when the variety is established from seedlings. For better establishment and yield, Diammonium phosphate (DAP) fertilizer at the rate of 100 kg/ha should be applied at planting. The plant gives optimum biomass yield and nutritional qualities when harvested at the recommended (100-150 cm) height. The plant should be harvested at 50 cm above the ground level when reached the recommended forage harvesting height. Summary of agro-morphological characteristics of the released Lattuu variety is indicated in Table 3.

Table 2. Average plant height (cm) of tagasaste varieties tested for four years at Holetta and Jeldu, in the central highlands.

Variety	Location		Mean
	Holetta	**Jeldu**	
15052	211.00	205.50	208.25
17497	213.75	196.25	205.00
15039	211.75	182.00	196.88
Check: MoA	218.25	214.25	216.25
Mean	**213.69**	**199.50**	**206.59**

Table 3. Agro-morphological characteristics of Lattuu (CI-15052) variety of tagasaste

Characteristics	**CI-15052**
Species	*Chamaecytisus palmensis*
Common name:	Tree lucerne/ Tagasaste
Variety name:	Lattuu (CI-15052)
Adaptation:	For highland areas
Soil type:	All soil types except vertisol
Altitude (m.a.s.l):	2400-3000
Rainfall (mm):	1200-1500
Seeding rate (number/ha):	20,000 plants
Intra row spacing (cm):	50
Inter row spacing (cm):	100
Planting materials:	seeds/ seedlings
Seed treatment:	Seed soaked in boiled water for 11 minutes
Planting date:	June to July
Fertilizer rate (kg/ha):	100 kg DAP or 46/18 kg N/P_2O_5
Time of fertilizer application:	DAP at planting
Recommended height at harvest:	100-150 cm
Harvested height from the ground:	50 cm above the ground
Survival percentage:	75-85

Yield performance

The overall mean indicated that the released variety Lattuu (CI-15052) produced the highest edible yield (7.46 t/ha) followed by a standard check (MoA) and variety CI-17497 (Table 4). On the other hand, the standard check variety gave the highest inedible yield (6.40 t/ha) when compared with the other candidate varieties. The released Lattuu variety gave the highest edible yield (7.58 t/ha) at Holetta. However, the highest edible yield (7.44 t/ha) was recorded from the standard check followed by the Lattuu variety at Jeldu. The highest mean percent edible yield (61.42%) was recorded from variety CI-15039 followed by the released Lattuu variety (60.91%) and variety CI-17497 (55.64%) while the standard check variety gave the lowest (53.16%) percent edible yield (Table 5). The released Lattuu variety and variety CI-15039 produced the highest percent edible yield of 63.77% and 62.01% at Jeldu and Holetta, respectively, while the standard check gave the lowest edible yield at both testing sites. The result indicated that the candidate varieties had percent edible yield advantages over the standard check (Table 6). The highest percent increase in edible yield (15.54%) over the standard check was recorded for variety CI-15039 followed by the release Lattuu variety (14.58%) and the lowest (4.67%) for variety CI-17497. Moreover, the released Lattuu variety had yield advantages of 24.63 and 10.33% over the standard check variety in terms of CP yield and digestible yield, respectively. Generally, the Lattuu variety gave a better percent edible yield and the highest CP yield and digestible yield advantages over the standard check variety.

Table 4. Average edible and inedible yields (t/ha) of tagasaste varieties tested for four years at Holetta and Jeldu, in the central highlands.

Variety	Holetta		Jeldu		Mean	
	Edible	Inedible	Edible	Inedible	Edible	Inedible
15052	7.58	5.41	7.33	4.17	7.46	4.79
17497	3.64	2.67	5.26	4.43	4.45	3.55
15039	5.64	3.46	1.56	1.07	3.60	2.26
Check: MoA	7.09	5.78	7.44	7.02	7.26	6.40
Mean	**5.99**	**4.33**	**5.40**	**4.17**	**5.69**	**4.25**

Note: total edible includes leaf plus edible branch

Edible forage DM yield of the varieties could vary across the test environments indicating the occurrence of cross-over type of interaction; i.e. interaction was associated with rank-order changes among the tested varieties for this trait across the test environments (Figure 1). This indicated that the two locations were distinctly different for some of the characters and that better varieties at one location may not also be better performing at another. When genotypes perform consistently across locations, breeders can effectively evaluate genotypes with a minimum cost in a few locations for the ultimate use of the resulting genotypes across wider geographic areas. However, with high genotype by location interaction effects, genotypes selected for superior performance under one set of environmental conditions may perform poorly under different environmental conditions. Therefore, it could be implicated that the selection of better performing genotypes at one location may not enable the identification of genotypes that can repeat nearly the same performances at another location.

Table 5. Percent edible yield (%) of tagasaste varieties tested for four years at Holetta and Jeldu, in the central highlands.

Variety	Location		Mean
	Holetta	Jeldu	
15052	58.37	63.77	60.91
17497	57.70	54.29	55.64
15039	62.01	59.37	61.42
Check: MoA	55.10	51.44	53.16
Mean	**58.05**	**56.41**	**57.26**

Note: total edible includes leaf plus edible branch

Table 6. Percent edible yield, crude protein, and *in-vitro* organic matter digestible yields advantage of tagasaste varieties over the standard check

Variety	% edible yield	% increase	CP yield	% increase	IVOMD yield	% increase
15052	60.91	**14.58**	1.67	**24.63**	4.06	**10.33**
17497	55.64	**4.67**	0.75	**-44.03**	1.91	**-48.10**
15039	61.42	**15.54**	1.15	**-14.18**	2.92	**-20.65**
Check: MoA	53.16	**-**	1.34	**-**	3.68	**-**

Note: total edible includes leaf plus edible branch; CP = crude protein; IVOMD = *in-vitro* organic matter digestibility

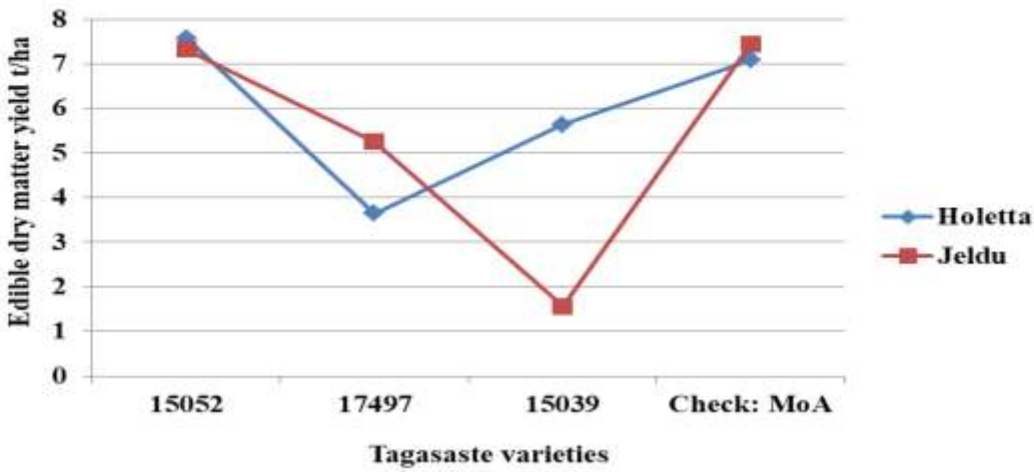

Figure 1. Edible DM yield performance of tagasaste varieties across the test environments

Reaction to diseases and pests

The candidate varieties were found to be resistant to moderately resistant to the recorded major disease and insect pests in the test locations during the study periods. The released Lattuu variety (CI-15052) was tested for its diseases and insect pests reaction starting from the initial stage of evaluation to the verification stage and found to be resistant to major diseases and insect pests which can affect the variety. The resistance reaction of the variety could be integrated with other diseases and insect pests' management strategies for better results. Generally, the released variety had better tolerance to major diseases and insect pests as compared to other candidate varieties and the standard check variety.

Quality attributes

The chemical composition and *in-vitro* organic dry matter digestibility of tagasaste varieties are summarized in Table 7. The result indicated that the standard check variety (MoA) had relatively the lowest (99.0 g/kg DM) ash content when compared with the candidate varieties, indicating low mineral concentration in the plant. Comparatively the highest ash content (114.1 g/kg DM) was recorded for variety CI-15039 followed by the released Lattuu variety (110.7 g/kg DM) and variety CI-17497 which had an ash content of 101.6 g/kg DM. The CP content of the tested tagasaste varieties showed a difference, ranging from 189.7 to 220.0 g/kg DM. The highest CP content was recorded for the released Lattuu variety followed by variety CI-17497 and CI-15039, while the standard check variety gave the lowest CP content. The lowest NDF content of 551.4 g/kg DM; ADF content of 360.4 g/kg DM and ADL content of 84.2 g/kg DM were recorded for the standard check variety, CI-17497 and the released Lattuu variety, respectively.

On the other hand, variety CI-15039, the released variety Lattuu and the standard check variety showed the highest NDF (556.3 g/kg DM), ADF (377.6 g/kg DM), and ADL (92.9 g/kg DM) contents, respectively. The IVOMD contents of the tested tagasaste varieties ranged from 518.0 to 535.5 g/kg DM. The released variety Lattuu gave the highest IVOMD content followed by variety CI-17497 (523.7 g/kg DM) and the standard check variety (519.2 g/kg DM) while variety CI-15039 produced the lowest IVOMD content.

The candidate varieties had an advantage over the standard check variety in terms of the leaf to stem ratio, CP, and IVOMD (Table 8). The result indicated that the highest (78.65%) percent increase in the leaf to stem ratio was recorded for variety CI-15039 followed by the released Lattuu variety (75.28%) while variety CI-17497 gave the lowest (40.45%) leaf to stem ratio increase over the standard check variety. The highest CP percent increase of 15.97, 8.59, and 7.64% over the standard check was recorded for released Lattuu variety, variety CI-17497, and variety CI-15039, respectively. The IVOMD of the candidate varieties also showed an advantage over the standard check variety. The released variety of Lattuu and variety CI-17497 showed IVOMD advantages of 3.14 and 0.87% over the standard check variety, respectively.

Table 7. Chemical compositions and *in-vitro* organic matter digestibility of tagasaste varieties

Variety	g/kg DM					
	Ash	CP	NDF	ADF	ADL	IVOMD
15052	110.7	220.0	552.3	377.6	84.2	535.5
17497	101.6	206.0	543.3	360.4	85.8	523.7
15039	114.1	204.2	556.3	370.3	92.5	518.0
Check: MoA	99.0	189.7	551.4	365.6	92.9	519.2

CP = crude protein; NDF = neutral detergent fiber; ADF = acid detergent fiber; ADL = acid detergent lignin; IVOMD = *in-vitro* organic matter digestibility.

Table 8. Leaf to stem ratio, crude protein, and *in-vitro* organic matter digestibility advantages of tagasaste varieties over the standard check

Variety	LSR*	% increase	CP	% increase	IVOMD	% increase
15052	1.56	75.28	220.0	15.97	535.5	3.14
17497	1.25	40.45	206.0	8.59	523.7	0.87
15039	1.59	78.65	204.2	7.64	518.0	-0.23
Check: MoA	0.89	-	189.7	-	519.2	-

LSR = leaf to stem ratio; CP = crude protein; IVOMD = *in-vitro* organic matter digestibility; *LSR calculate as = edible yield/stem yield; edible yield= leaf+ edible branch.

Adaptation

The released tagasaste variety, Lattuu (CI-15052), is well adapted for the high-altitude areas of the country. The variety performed very well in areas with an altitude of 2400 to 3000 meters above sea level which has an annual rainfall of 1200 to 1500 mm. It could also be possible to extend the production of the released variety to other areas with similar agro-ecologies after doing an adaptation trial. The released variety produces relatively better forage DM yield when a recommended fertilizer rate is applied and population density is used at planting. For better performance, the seedlings should be transplanted in mid-June to July under rainfed conditions and any time when irrigable water is available. The released variety has better forage DM yield performance in the high altitude areas when compared to mid-altitude areas of the country.

Variety maintenance

The pre-basic and basic seeds of the released Lattuu variety are maintained by the feeds and nutrition research section of Holetta Agricultural Research Center.

Conclusion

The released Lattuu variety gave relatively better percent edible yield and the highest CP yield and digestible yield advantages over the standard check variety. On the other hand, the standard check variety gave the highest inedible yield when compared with the other candidate varieties. The nutritional qualities indicated that the candidate varieties had advantages over the standard check variety in terms of the leaf to stem ratio, CP, and IVOMD contents. Generally, the released Lattuu variety had relatively better leaf to stem ratio, CP, and IVOMD advantages over the standard check (MoA) variety. Based on the overall performance, the Lattuu variety (CI-15052) of tagasaste was officially released in April 2018 for the highland areas and similar agro-ecologies of the country.

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