Differential Availability of different Weed Species for Cattle Production in the selected Derived savannah and Rainforest Agro-ecological Zones of Nigeria

Abstract

Among the major factors that determine the success of cattle production in Nigeria is the availability of palatable weed species. Hence the need to conduct research on the availability of palatable, edible and non-edible weed species for cattle production in the selected two agro-ecological zones (Derived savannah and rainforest) of North center and Southwest ~~in~~ Nigeria becomes imperative. The study involved three parallel transects, each of 12.5 m x 12.5 m and ten evenly spaced different weed species sampled quadrats (1 m x1 m) were taken and replicated three times. The results showed that non-edible *Hyptis suaveolens* (94.2%) dominated the derived savannah and palatable *Pennisetum* species (36.8%) dominated the rainforest. The analysis of variance and New Duncan Multiple Range Tests ($p = 0.05$) revealed that there was a statistically significant ($p \leq 0.01$) difference within the agro-ecological zones and availability of palatable, edible and non-edible weed species. However, in the derived savannah agro-ecological zone, the non-edible weed species had pronounced significant ($p \leq 0.01$) availability, while in the rainforest agro-ecological zone, the palatable weeds had pronounced significant ($p \leq 0.01$) availability. It could be concluded therefore, that if urgent steps are not taken, cattle will continue to move from the derived savannah (more non-edible weeds) to rainforest (more palatable weeds) and this will cause farmers-herders~~'~~ conflict. In addition, there would be more propagation of these non-edible weeds especially *H. suaveolens* as a result of cattle movement to the rainforest, an act that could cause more weeds imbalance in the rainforest.

Key words: Weed species; *Hyptis suaveolens*; Cattle production; palatable; edible; climate change.

Introduction

Among all the livestock that make up farm animals in Nigeria, ruminants, comprising sheep, goats and cattle, constitute the farm animals largely reared by farm families in the country's agricultural system (Lawal-Adebowale, 2012). Exclusive pastoral practice or nomadic preoccupation entails sole management of ruminants, especially cattle for the socioeconomic well-being of the pastoral farmers, (Blench, 1998). Exclusive pastoralists do not grow crops but simply depend on sales of their ruminants and dairy products to meet their food needs, whereas their animals depend mainly on available pastures, hence as the plant is very important to the survival of man so also is it for animals. Most plants that are palatable for human beings are also suitable for animals. However, not all plants that are palatable for animals are also good for the consumption of man. A dimension to this development is the increase in farmer-herder conflicts throughout much of the western Sahel, due to the expansion of the agriculturist population and cultivated land which is at the expense of pasturelands; deteriorating environmental conditions, desertification and soil degradation; population growth (Ilo *et al.*,2019), breakdown in traditional conflict resolution mechanisms of land and water disputes; and proliferation of small arms and crime in rural areas (Baca, 2015). Insecurity and violence have led many populations to create self-defense forces and ethnic and tribal militias, which have resulted in further violence. Most of the farmer-herder clashes have occurred between Muslim Fulani herdsmen and farmers, thereby exacerbating hostilities (IPI, 2015). This is to say that there is competition between man and animal for space, water and plant resources especially when the resources are useful to both.

Sometimes, this competition has metamorphosed into unsettled conflicts owing to climate change which has drastically reduced the existence of some resources. For instance, in the 60s, the Sahel and Sudan Savannah of Nigeria were filled with shrubs and grasses that are palatable for cattle and other ruminants (Bayala *et al*, 2014). However, due to the inability to manage the

ecosystem well, shrubs and water resources have been seriously depleted thereby giving room to the emergence of invasive plants such as *Hyptis suaveolens.* This plant has the characteristics of multiplying itself within a very short time as well as suppressing other plants. The seed has the opportunity of sticking to the fur of cattle while the cow dung serves as fertilizer for its growth.

The drift of herdsmen to the southern derived and rainforest zones also comes along with the invasive plant (*Hyptis spp*) in all the available land causing drastic reduction in the availability of other pastures. Thus, if quick attention is not taken, further conflicts are still imminent and inevitable. This seems to be the main reason for looking at the weed/plant surveys for determining species palatability, edibility, non-edibility and their distribution as they affect cattle production (Nkoa *et al.* 2015). The number of weed species had changed as a result of the changing climate and alterations caused by agricultural practices including cattle production (Keller *et al.* 2015; Richner *et al.* 2017).

General objective

The general objective of this study was to assess the differential availability of different weed species for cattle production in the selected derived savannah and rainforest agro-ecological zones of Nigeria.

Specific objectives

The specific objectives are to determine the differential availability of palatable, edible, and non-edible weed species in the study area.

Materials and method

Location/sites

Two agro-ecological zones (Derived savannah and Rainforest zones) were selected from the Southwest and North central of Nigeria. The Savannah agro-ecological zone comprises of Ibarapa North Local Government area in Oyo State, Southwest Nigeria and Baruten Local Government area in Kwara State (North-central). The Rainforest agro-ecological zone comprises Akinyele Local Government area in Oyo State, Southwest and Ayedaade Local Government area in Osun State (Southwest). Ibarapa North, Baruten, Akinyele and Ayedaade Local Government areas.

Weed data

Weed surveys for determining species palatability, edibility, non- edibility involved three parallel transect lines each 12.5 m in length and 12.5 m apart from each other were set out. Quadrats of 1 m × 1 m were laid down along the transect lines and weed species data were collected from 10 evenly spaced sample quadrats replicated three times which gave thirty quadrats per location. Individual weed species falling within the quadrat were identified, counted and listed, using a field identification guide prepared by Stroud and Parker (1989). An ~~I~~in-depth interview was also conducted with the cattle herders with a view to gaining knowledge based on the contact of cattle with weed species.

Weed data analysis

The availability of weed species was calculated by counting the number of recorded species per quadrat. The data on weed species availability was generated using frequency, abundance and dominance procedures as outlined in Tesema and Lema (1998). The frequency of weed species was calculated by dividing the number of quadrats in which particular weed species occurred by the total number of quadrats and multiplying the outcome by 100 using the formula:

$f = x/ n \times 100$, (Tesema and Lema, 1998),

where f = frequency of a particular weed species

x = number of samples in which a particular weed species occurs

n = total number of samples

Statistical analysis

The generated data were subjected to analysis of variance by minitab 17.0 and the means separated using New Duncan's multiple range test .

Results and discussion

The characteristics of the sampled agro-ecological zones (Table 1) indicated that combined Akinyele and Ayedaade Local Government areas (rainforest) had more square kilometers of land area (466,005), population (362,203) and mean annual rainfall (1,377.8 mm) than the savannah (Ibarapa North and Baruten local government areas).

Weed species as sampled from Ibarapa LGA (Table 2) indicated that five (5) weed species were palatable and edible respectively, while seven (8) were non-edible. *Stylosanthes gracilis* (55%) was the highest, and *Elusine indica* (3.1%) was the least palatable weed species available. *Axonopus Compressus* (40.8%) and *Sorghum halepense* (4.9%) were the highest and least available edible weed species respectively, while *Hyptis suaveolens* (91.7%) and *Achyranthes aspera* (0.3%), which were the highest and least available non-edible weed species respectively from derived savannah zone of Ibarapa North LGA. The reason for the prevalence of *Stylosanthes gracilis* is that it is a leguminous grass that can survive in an odd environment. *Hyptis suaveolens* is the most prominent non-edible grass because it has a high tendency to multiply faster than all other weeds in the zone. The implication for cattle production is that less palatable and edible grasses are available in the derived Savannah zone.

Table 1: Characteristics of sampled agro-ecological zones

Agro-ecological Zones	Land area (Km^2)	Population	Latitude	Longitude	Mean annual temperature	Mean annual rainfall
a. Derived savannah						
i. Ibarapa North LGA	1,218	101092	7.6865°N	3.1780°E	28°C	300mm
ii. Baruten	9749	209459	9.3493°N	3.5813°E	28°C	101.5mm
b. Rainforest						
i. Akinyele LGA	464,892	211811	7.5503°N	3.9470° E	29°C	1,250mm
ii. Ayedaade LGA	1113	150392	7.2800°N	4.2100° E	29°C	127.8mm

Source: Author, 2022

Table 2: Average number of weed species in the selected Ibarapa North Local government area in Oyo State, derived savannah agro-ecological zone (q=30)

S/n	Palatable	f	%	Edible	f	%	Non-edible	F	%
1	*Stylosanthes gracilis*	160	55	*Axonopus compressus*	42	40.8	*Boehmeria nivea*	14	0.7
2	*Panicum maximum*	12	4.1	*Sorghum halepense*	5	4.9	*Bidens bipinnata*	60	2.9
3	*Pueraria phaseoloides*	75	26	*Indigofera tinctoria*	10	9.7	*Achyranthes aspera*	7	0.3
4	*Cymbopogon citratus*	34	12	*Cyperus rotundus*	12	11.7	*Aeschynomene americana*	40	1.9
5	*Elusine indica*	9	3.1	*Chromolaena odorata*	34	33	*Hyptis suaveolens*	1923	91.7
6							*Triumfetta rhomboidea*	8	0.4
7							*Passflora foetida*	24	1.1
8							*Phyllanthus amarus*	21	1.0

However, the *H. suaveolens* have taken sizeable areas of agricultural land with invasive plant that are not edible for cattle production. This implies that cattle may not get quality feeds on time which may delay their growth or enforced the herders to move into farmlands to feed their animals, thereby resulting in conflicts. There are more available palatable (9) weed species

(Table 3) than the edible (3) and non- edible (5) in Baruten LGA. However, *S. gracilis* (46.4%), *A. africana* (51.9%) and *H. suaveolens* (98%) were the highest available for

Table 3: Average number of weed species in the selected Baruten local government area in Kwara State, derived savannah agro-ecological zone (q = 30).

S/N	Palatable	F	%	Edible	f	%	Non-edible	f	%
1	*Stylosanthes gracilis*	123	46.4	*Cyperus rotundus*	26	32.9	*Cassia hirsute*	7	0.5
2	*Panicum maximum,*	6	2.3	*Aspilia Africana*	41	51.9	*Ageratum conyzoides,*	6	0.4
3	*Pueraria phaseoloides*	42	15.8	*Chromolaena odorata*	12	15.2	*Hyptis suaveolens,*	1443	98
4	*Brachiaria lata*	21	7.9				*Cassia mimosoides*	6	0.4
5	*Elusine indica*	7	2.6				*Melanthera scandens*	16	1.1
6	*Andopogon gayanus,*	13	4.9						
7	*Paspalum polystachyum*	7	2.6						
8	*Cymbopogon citratus*	6	2.3						
9	*Tithonia diversifolia*	40	15.1						

palatable, edible and non-edible, while *P.maximum* (2.3%) and *C. dactylon* (2.3%), *C. odorata* (15.2%), *A.conyzoides* (0.4%) and *C. mimosoides* (0.4%) are the least for available palatable, edible and non-edible respectively. The dominance of *S. gracilis* and *P. phaseoloides* in Baruten LGA is due to the fact that both weeds are leguminous plant. Fewer numbers of edible weeds imply that they have been suppressed by the invasive plant; *H. suaveolens*. The in-depth interview carried out in the study area revealed that their cattle started eating the tender part of *H. suaveolens* when they could not get enough feed. This may not give them any nutritious value.

There were average fifteen different weed species available in Akinyele LGA (Table 4); palatable (9), edible (3) and non-edible (3). *Pennisetum spp* (37%), *C. odorata* (74.4%) and *H. suaveolens* (77.8%) are the highest available for palatable, edible and non-edible, while *S. gracilis* (0.5%), *C. rotundus* (6.9%) and *P. amarus* (5.9%) are the least for available palatable,

edible and non-edible weed species respectively. Unlike in the derived Savannah zone, more palatable weed species were available in the rainforest zone of Akinyele LGA with few edible and non-edible weed species. The presence

Table 4: Average number of weed species in the selected Akinyele local government area in Oyo State, rainforest agro-ecological zone (n = 30).

S/N	Palatable	F	%	Edible	F	%	Non-edible	f	%
1	*Stylosanthes gracilis*	7	0.5	*Cyperus rotundus*	14	6.9	*Passithora toetida*	22	16.3
2	*Panicum maximum,*	357	23.4	*Aspilia africana*	38	18.7	*Hyptis suaveolens*	105	77.8
3	*Pueraria phaseoloides*	152	10	*Chromolaena odorata*	151	74.4	*Phyllanthus amarus*	8	5.9
4	*Brachiaria lata*	287	18.8						
5	*Andopogon gayanus,*	89	5.8						
6	*Pennisetum spp*	566	37						
7	*Paspalum polystachyum,*	34	2.2						
8	*Cymbopogon citratus*	22	1.4						
9	*Tithonia diversifolia*	14	0.9						

of *H. suaveolens* was not noticeable in the zone. However, since cattle have started moving to the zone, it calls for quick attention so that it does not suppress other weed species in a relatively short time. Eleven different weed species were available in Ayedaade local government area; palatable (7), edible (2) and non-edible (2) (Table 5). The available weed species *P.ennisetum spp* (36.5%) *C. odorata* (67.6%) and *H. suaveolens* (82.1%) had the highest, while *S. gracilis* (0.3%), *A. africana* (32.4%) and *C. hirsute* (17.9%) were the least available palatable, edible and non-edible weed species respectively. As it is in Akinyele LGA which is in the rainforest zone, there are more palatable weed species in Ayedaade LGA of Osun State which is also a forest zone. There were fewer numbers of edible and non-edible weeds.

The derived savannah agro-ecological zone of Nigeria (Table 6) represented by two local governments; Ibarapa Local Government area in Oyo State and Baruten Local Government area in Kwara State indicated that the available non-edible weed species *H. suaveolens* (94.2%) was predominated, followed by palatable weed species; *S. gracilis* (51%), and edible weed species of *A. compressus* (28.4%) were the least. Considering the availability of

Table 5: Average number of weed species in the selected Ayedaade local government area in Osun state, rainforest agro-ecological zone (q = 30).

S/N	Palatable	F	%	Edible	F	%	Non-edible	F	%
1	*Stylosanthes gracilis*	4	0.3	*Aspilia africana*	44	32.4	*Cassia hirsute*	21	17.9
2	*Panicum maximum,*	283	18	*Chromolaena odorata*	92	67.6	*Hyptis suaveolens*	96	82.1
3	*Pueraria phaseoloides*	94	6						
4	*Brachiaria lata*	262	16.7						
5	*Andopogon gayanus,*	192	12.2						
6	*Pennisetum spp*	574	36.5						
7	*Tithonia diversifolia*	163	10.4						

Table 6: Average number of weed species in the all selected savannah agro-ecological zone (q = 30)

S/N	Palatable	F	%	Edible	F	%	Non-edible	F	%
1	*Stylosanthes gracilis*	283	51	*Axonopus compressus*	42	28.4	*Cassia hirsute*	7	0.2
2	*Panicum maximum,*	12	2.2	*Sorghum halepense*	5	3.4	*Ageratum conyzoides*	6	0.2
3	*Pueraria phaseoloides*	117	21.1	*Indigofera spicata*	10	6.8	*Bidens bipinnata*	60	1.7
4	*Brachiaria lata*	21	3.8	*Cyperus rotundus*	38	25.7	*Achyranthes aspera*	7	0.2
5	*Cymbopogon citratus*	34	6.1	*Aspilia africana,*	41	27.7	*Aeschynomene americana,*	40	1.1

6	*Elusine indica*	16	2.9	*Chromolaena odorata*	12	8.1	*Hyptis suaveolens*	3366	94.2
7	*Andopogon gayanus*	13	2.3				*Triumfetta rhomboidea*	8	0.2
8	*Pennisetum spp*	6	1.1				*Cassia mimosoides*	6	0.2
9	*Paspalum polystachyum*	7	1.3				*Passflora foetida*	24	0.7
10	*Cynodon dactylon*	6	1.1				*Melanthera scandens*	16	0.5
11	*Tithonia diversifolia*	40	7.2				*Phyllanthus amarus*	21	0.6
12							*Boehmeria nivea*	14	0.4

different weed species in the savannah, it was discovered that palatable and non-edible species had eleven different weed species each, while the edible weed species were only six. This implies that with six *H. suaveolens* stands in the area, there will be only one palatable weed specie. It also indicates that before cattle will get one of the palatable weed species, they will get six *H. suaveolens*. With this figure, there is no way herdsmen will not move into arable land to get feeds for their cattle, an act that may result in conflict. A total of 31 different weed species were identified across the sampled agro-ecological zones as palatable, edible and

Table 7: Average number of weed species in the all selected rainforest agro-ecological zone (q = 30)

S/N	Palatable	F	%	Edible	F	%	Non-edible	f	%
1	*Stylosanthes gracilis*	11	0.4	*Cyperus rotundus*	14	4.1	*Cassia hirsute*	21	8.3
2	*Panicum maximum,*	640	20.6	*Aspilia africana*	82	24.2	*Hyptis suaveolens*	201	79.8
3	*Pueraria phaseoloides*	246	7.9	*Chromolaena odorata*	243	71.7	*Passflora foetida*	22	8.7
4	*Brachiaria lata*	549	17.7				*Phyllanthus amarus*	8	3.2
5	*Andopogon gayanus,*	281	9.1						
6	*Pennisetum*	1140	36.8						

	spp		
7	*Paspalum polystachyum,*	34	1.1
8	*Cymbopogon citratus*	22	10.7
9	*Tithonia diversifolia*	177	5.7

non - edible. In the savannah (Ibarapa North and Baruten local government areas) agro-ecological zones (Table 7), a total of 29 weed species were observed and identified and categorized as palatable (11), edible (6) and non-edible (12), while in the rainforest (Akinyele and Ayedaade local government areas) agro-ecological zones (Table 8), a total of 16 weed species were also identified and categorized as palatable (9), edible (3) and non-edible (4). It was also noted that some of the 31 different weed species cut across the two agro-ecological zones. The rainforest (Table 7) which consisted of two local governments in Oyo State and Osun States indicated that there were more palatable weed species (9) in the rainforest zone than the non-edible (4) and edible (3) as estimated. *P.ennisetum spp* (36.8%), *C. odorata* (71.7%) and *H. suaveolens* (79.8%) are the highest, while *S. gracilis* (0.4%), *C. rotundus* (4.1%) and *P. amarus* (3.2%) are least for palatable edible and non-edible respectively. Unlike the derived savannah zone that was predominantly dominated by *H. suaveolens*, there were more palatable weed species in the rainforest agro-ecological zone. Considering the ratio of the palatable to *H. suaveolens*, we have ratio 18:1 respectively which differs from that of the derived Savannah agro-ecological zone. This shows the reason why herdsmen move their cattle to the forest zone. Before, the zone used to be very thick forest that are very difficult for cattle to move into. Gradually, the forest may soon be depleted in due course as a result of cattle invasion and the presence of *H. suveolens*.

The analysis of variance of different weed species in different ecological zone (Table 8) indicated that there was statistically significant ($p \leq 0.01$) difference within the ecological zones

and availability of weed species (palatable, edible and non-edible), in all derived savannah (Ibarapa North and Baruten local government areas) zone, the non – edible weed species had pronounced significant (3,055,161; $p \leq 0.01$) availability than the palatable (20,909.7; $p \leq 0.01$) and edible (904; $p \leq 0.01$). New Duncan's multiple range test (Table 9) was used to separate means weed species within different ecological zones, indicat 11 weed species across the derived savannah ecological zone were sampled; availability of palatable weed species of *S.gracilis* (284a), *P.phaseoloides (*117b) , *B.lata* (21e), *C.citratus* (34d), *A.gayanus* (13g) and *T.diversifolia* (40c) were statistically significantly (p=0.05) different from availability of *P.maximum* (18f) and *E.indica* (16f) that are statistically (p =0.05) the same. Also, *P.ennisetum spp* (6h) *P.polystachyum* (7h) and *C.dactylon* (6h) had the same (p =0.05) availability index. New Duncan multiple range test (Table 10) revealed that six available edible weed species in derived savannah with *A.compressus* (42a) and *A.africana* (41a) are statistically (p =0.05) the same, also *I.tinctoria* (10c) and *C.odorata* (12c) are statistically (p =0.05) the same and statistically (p =0.05) different from *S.halepense* (5d) and *C. rotundus* (38b). It was, therefore noted (Table 8) that, the derived savannah agro-ecological zone had more pronounced statistical significant ($p \leq 0.01$) availability of non-edible weed species of *H. suaveolens* (3366a) than other weed species. However, availability of non-edible of

Table 8: Analysis of variance of weed species of selected agro-ecological zones (Savannah and Rainforest)

Ecological zones /Sources of variation	Palatable ms	p-v	Edible ms	p-v	Non-edible ms	p-v
Ibarapa LGA (Oyo State)	11804.1**	0.001	800.4**	0.001	1542209**	0.001
Baruten LGA (Kwara State)	4301.3**	0.001	631**	0.001	1234297**	0.001
Akinyele LGA (Oyo State)	112887**	0.001	16057**	0.001	6247**	0.001

Ayedaade LGA (Osun State)	98771.7**	0.001	3456**	0.001	8437.5**	0.001
All derived savannah zone	20909.7**	0.001	904**	0.001	3055161**	0.001
All forest zone	418271**	0.001	41493**	0.001	25596.8**	0.001

Notes: **significant at p≤ 0.01, ms = mean square, p-v = probability value.

Table 9: New Duncan Multiple Range Test (NDMRT) to separates palatable weeds species means as they occurred at various selected ecological zones (Savannah and Rainforest)

S/N	Weed species	ILG	BLG	ALG	AYL	ALS	ALF
1	*Stylosanthes gracilis*	160a	123a	7c	4g	284a	11i
2	*Panicum maximum*	12d	6e	357b	283b	18f	640b
3	*Pueraria phaseoloides*	75b	42b	152d	94f	117b	246e
4	*Brachiaria lata*	NA	21c	287c	263c	21e	549c
5	*Cymbopogon citratus*	35c	NA	NA	NA	34d	NA
6	*Elusine indica*	9e	7e	NA	NA	16f	NA
7	*Andopogon gayanus*	NA	13d	89e	192d	13g	281d
8	*Pennisetum spp*	NA	NA	563a	574a	6h	1140a
9	*Paspalum polystachyum*	NA	7e	34f	NA	7h	34g
10	*Cynodon dactylon*	6e	22e	NA	NA	6h	22h
11	*Tithonia diversifolia*	NA	40b	14h	163e	40c	117f

Notes: Means that do not share a letter within the column differs significantly at p = 0.05**.** NA= Not available.

Table 10: New Duncan Multiple Range Test (NDMRT) to separates Edible weeds species means as they occurred at various selected ecological zones (Savannah and Rainforest)

S/n	Weed species	ILG	BLG	ALG	AYL	ALS	ALF
1	*Axonopus*	42a	NA	NA	NA	42a	NA

	compressus						
2	*Sorghum halepense*	5d	NA	NA	NA	5d	NA
3	*Indigofera tinctoria*	10c	NA	NA	NA	10c	NA
4	*Cyperus rotundus*	12c	26b	14c	NA	38b	14c
5	*Aspilia africana*	NA	41a	36b	44b	41a	82b
6	*Chromolaena odorata*	34b	12c	151a	92a	12c	243a

Notes: Means that do not share a letter within the column differs significantly at p = 0.05**.** NA= Not available.

Table 11: New Duncan Multiple Range Test (NDMRT) to separates Non – edible weeds species means as they occurred at various selected ecological zones (Savannah and Rainforest).

S/n	Weed species	ILG	BLG	ALG	AYL	ALS	ALF
1	*Boehmeria nivea*	14f	NA	NA	NA	NA	NA
2	*Cassia hirsute*	NA	7c	NA	21b	7g	21b
3	*Ageratum conyzoides*	NA	6c	NA	NA	6g	NA
4	*Bidens bipinnata*	60b	NA	NA	NA	60b	NA
5	*Achyranthes aspera*	7g	NA	NA	NA	7g	NA
6	*Passithora toetida*	NA	NA	22b	NA	NA	NA
7	*Aeschynomene Americana*	40c	NA	NA	NA	40c	NA
8	*Hyptis suaveolens*	1923a	1443a	105a	96a	3366a	201a
9	*Phyllanthus amarus*	21e	NA	6c	NA	21e	8c
10	*Triumfetta rhomboidea*	8g	NA	NA	NA	8g	NA
11	*Cassia mimosoides*	NA	6c	NA	NA	6g	NA
12	*Passflora foetida*	24D	NA	NA	NA	24d	21b
13	*Melanthera scandens*	NA	16b	NA	NA	16f	NA

Notes: Means that do not share a letter within the column differs significantly at p = 0.05**.** NA= Not available

C. hirsuta (7g), *A. conyzoides* (6g), *T.rhomboidea* (8g), *A. aspera* (7g) and *C. mimosoides* (6g) are statistically (p =0.05) the same and statistically (p =0.05) different (Table 11) from *B.bipinnata* (60b), *A.americana* (40c), *H. suaveolens* (3366a), *P.amarus* (21e), *P.foetida* (24d), and *M. scandens* (16f).

The analysis of variance (Table 8) of availability of different weed species in the rainforest agro-ecological zone indicated that the palatable weed species had pronounced statistically significant (418,271; $p \leq 0.01$) availability than edible (41,493; $p \leq 0.01$) and non-edible (25,596.8; $p \leq 0.01$). New Duncan multiple range tests (Table 9) revealed that all the palatable weed species (nine) were statistically significantly (P =0.05) available, but *C. citratus* and *E. indica* species were not available (p =0.05), however, the availability of palatable weed species in the rainforest of *S. gracilis* (11i), *P. maximum* (640b), *P. phaseoloides* (246e), *B. lata* (549c), *A. gayanus* 281d), *P.ennisetum spp* (1140a), *P. polystachyum* (34g), *C. dactylon* (22h) and *T. diversifolia* (117f) were statistically significantly (P = 0.05) different in their respective availability, where *Pennisetum spp* (1140a) had more pronounced significant (p =0.05) availability than other palatable weed species in the rainforest zone. New Duncan multiple range tests (Table 10) revealed that all three edible weed species (*C. rotundus* – 14c, *A.africana* – *82b* and *C.odorata* – 243a) were statistically significantly (P =0.05) different in availability in the rainforest zone, while availability of non-edible weed species of *C.hirsuta* (21b) and *P.foetida*

(21b) are statistically (p =0.05) different from *H.suaveolens* (201a) and *P.amarus* (8c) (Table 11).

Comparison of analysis of variance (Table 8) of availability of different weed species between the derived savannah and rainforest agro-ecological zone indicated that rainforest zone had pronounced significant ($p \leq 0.01$) availability of palatable and edible (418,271; 41,493) weed species than the derived savannah zone (20,909.7; 904) respectively, while the derived savannah agro-ecological zone had more pronounced significant (3055161; $p \leq 0.01$) availability of non – edible weed species especially *H. suaveolens* (3366a) than rainforest agro-ecological zone. The implication of the results in addition to less land area per person (0.04 km^2/person in derived savannah compare to rainforest (1.29 km^2/person) is that, cattle may grow lean in the derived savannah agro-ecological zone due to lack/inadequate palatable and edible pasture than the cattle in the rainforest except they get supplement feeds. Without the availability of supplement feeds, herders may take their cattle to feed from agricultural lands in the rainforest agro-ecological zone due to more arable lands availability of palatable and edible pastures. This may be the reason more conflicts are recorded in the savannah zones than the rainforest agro-ecological zone.

Conclusion and recommendations

The study noted that, there were pronounced availability of palatable and edible pastures (especially, *Pennisetum spp, P. maximum, A. africana* and *C. odorata),* for cattle production in the rainforest agro-ecological zone than the derived savannah agro-ecological zone with pronounced availability of non – edible weeds (especially, *H. suaveolens, B. bipinnata, A. americana* and *P. foetida*) . It was also observed that *H. suaveolens* which dominated land in the derived savannah agro-ecological zone may spread to rainforest zone through the movement of

the cattle from the derived savannah in search of palatable pastures. This may eventually create pasture imbalance in the rainforest agro-ecological zone if not checked.

It is therefore, recommended that the Federal Ministry of Agriculture and environment should be encouraged to reduce the imbalance created by the invasion of *H. suaveolens* and other weed species through the use of appropriate research institutions. Intensive cattle production should be encouraged with adequate support from the government and non – governmental organizations. Provisions of pastures seeds to the cattle herders and involvement in the multiplication should be encouraged.

Sampling zones: *ILG= Ibarapa North LGA, BLG= Baruten LGA, ALG= Akinyele LGA, AYL =Ayedaade LGA, ALS= All savannah, ALF=All forest.*

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