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Fruiting Season, Flowering and Peel Characteristics of *Leucaena* spp. Analytical Study (B)

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Abstract. During the flowering seasons the species varied greatly and the seasons were seldom repeated (August-October) with only three species and two species (April-June), which means that they continued throughout the months of the year. Three colours of the flower were observed in total with gradient within these three colours distributed to the studied species. In terms of the colour of the peel, two colours were distinguished only in favour of the brown-gray colour, while the forms of cracks on the outer peel surface were divided into three forms. On the other hand, each type was independent when examining the colour of the inner peel. The shape of the cross section of the branch exceeded 81.8% for the circular shape on the angular shape, while two types of branch thickness were recorded and exactly the same for texture. It was possible to observe two forms of branching of the flower-bearing branches, which were very similar to those of the two forms (non-branching and branching) with a large difference between the two forms of the flower's apex, at a rate of 20 times the round shape and 90.9% of the shape of the flower. Two flowers shoots growing types were observed named (Auxotelic and an Anauxotelic). Three main colours, white, yellow and pink were distinguished and the flower head diameter varied widely between (6.5-30 mm). Flowers season seems to be in all of the year. Outer peel thickness also varied from thick to thin to intermediate. Three forms of peel fissures were found and 54.5% to mid-brown colour. Inner peel colour can be a good item to be a key of classification of this tree. Correlation coefficient between peel thickness and outer peel colour was 0.935.

Keywords: *leucaena*, forage, fruiting, pasture plants

Introduction

Researcher's interest in a particular subject comes from the importance of that subject, particularly when it comes to production, productivity and versatility. This is true of the *Leucaena* tree, which has many uses, while it is used to feed animals reported by (Abou-Elezz *et al*., 2011). It is used in construction and power transmission poles and others of its uses is to provide an excellent environment for bee keeping because its flowers contain high attractiveness and abundant nectar. (Barros-rodriguez *et al.*, 2014). It can also be used as windbreaks and fencing for gardens and fields for their rapid growth, rapid spread and harmonious shape. More recently, researchers have sought to extract medical and pharmaceutical ingredients to treat certain diseases (Devi *et al.*, 2013). We cannot fail to mention that they are widely used for human consumption, especially the seeds, because they contain up to 35% protein (Jones, 1999). The tree species varied according to geographical location, elevation from sea level and soil type, and 22 species were identified in this study. What distinguishes this tree is that it has very different flowering seasons between species and almost year round, which provides a high sustainability (Malik *et al.*, 2004). Due to the large differences in the specific gravity of the known species (0.5-0.8) (Shaikh, 2009) and this resulted in the possibility of multiple uses of wood in all fields. There was a limitation to make utilization because of toxic constituents in *leucaena* forage and seeds (Gosh and Bandyopadlhyay *et al*., 2007). The *Leucaena* could be mixed with other fodder plants to increase production and reduce the cost of the cattle fodder (Bowen *et al*., 2016). In a previous study, the researcher (Al-Bugg, 2017) studied some morphological characteristics related to this tree.

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Materials and Methods

Information was obtained from (*Leucaena* a genetic resources handbook), Hughes (1998), which demonstrated 22 forms of *Leucaena* with strong contrasts between qualities were considered and the informations identified with fruiting seasons, blossoming (with numerous things) and strip attributes were chosen, grouped, classified and after that dissected utilizing

(Statistical Package for Scientific Search) to decide Frequencies to get results about their frequencies and afterward to recognize species under this examination. Connections with a few characteristics were also done for increasingly precise performance, then we tried to complete a cross tab dissection to think about the contact between attributes. The accompanying items combine by breaking down the incorporated the following flowering seasons:

Fruiting seasons. (1) Flower colours group; (2) Branching flowering shoot; (3) The type of growing flowering shoot; (4) Flowering shoot thickness; (5) Flowering bracket apex; (6) Flower colour degree; (7) Number of flowers in the flowering shoot apex; (8) Flower head diameter.

Peel characteristics as. (1) The outside peel thickness; (2) The outside surface colour of the peel; (3) Outer peel surface fissures; (4) Inner peel colour; (5) Peel shape; (6) Outer peel boles; (7) Branches outer peel; (8) Species collected are presented in Table 1.

Results and Discussion

To viewing results, Tables for each item we had studied to explain frequencies, percent and the valid classification of the property.

Table 1. The types of *Leucaena* (Hughes, 1998)

L. collinsii Britton & Rose
L. confertiflora S. Zarate
L. cuspidata Stmdley
L. diversifolia (Schltdl.) Benth.
L. esculenta (Sesse & Moc. Ex)
L. greggii S. Watson
L. involucrata S. Zarate
L. lanceolata S. Watson
L. lempirana C.B. Hughes
L. leucocephala (Lam.) de Wit
L. macrophylla Benth.
L. magnifica (C.E. Hughes) C.E.
L. matudae (S. Zarate) C.E.
L. multicapitula Schery
L. pallida Britton & Rose
L. pueblana Britton & Rose
L. pulverulenta (Schltdl.) Benth.
L. retusa Benth.
L. salvadorensis Standley ex
L. shannonii 1.0. Smith
L. trichandra (Zucc.) Urban
L. trichodes (lacq.) Benth.

Fruiting season. There were no essential groups to be used to distinguish between species when evaluating this attribute. This means that the largest group of species independently became independent during the fruiting season and almost covered all seasons of the year, which is very useful in distinguishing between species. The diversity of the growth areas of these species and the appropriateness of separating growth of species, noting that the most frequent months of February, which was repeated four times. Table 2.

Table 2. Frequencies of fruiting season

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	August-February	1	4.5	4.5	4.5
	August-November	1	4.5	4.5	9.1
	August-October	2	9.1	9.1	18.2
	December-February	1	4.5	4.5	22.7
	December-March	2	9.1	9.1	31.8
	February-April	1	4.5	4.5	36.4
	February-March	4	18.2	18.2	54.5
	January-February	1	4.5	4.5	59.1
	January-May	1	4.5	4.5	63.6
	July-December	2	9.1	9.1	72.7
	March-April	1	4.5	4.5	77.3
	March-May	2	9.1	9.1	86.4
	November-December	1	4.5	4.5	90.9
	October-November	1	4.5	4.5	95.5
	September-January	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Flowering season. As predicted the flowering seasons varies from one type to another because of the various climatic and environmental conditions due to the spread of these species across the globe in general, resulting in continuous regeneration all over the year (Tewari *et al*., 2004). We did not notice the similarity of the season of flowering of a particular species with another type of *Leucaena* tree except in very few cases, (August-November) with three replicates and another season (April-June) (October-November) with two replicas only, while the rest of the species were spread throughout the year which observed in Table 3.

Flower colours group. Flower colours were divided according to statistical analysis into three common categories: white colour 16 times and 72.7% followed by reddish pink or pale purple with four recurrences and 18.2%. Finally, the lowest frequency is the bright yellow colour only by 9.1%. It is important to distinguish

between species as a virtual property accessible to the naked eye shown in Table 4.

Branching flowering shoot. In addition to the study of floral characteristics, in order to determine the trends of flowers, a statistical analysis was carried out. We found that the type (Unbranched) is superior to the second type (one branch, but one-way), because 12 and 10 recurrences respectively were very similar and registered in the Table 5.

Table 3. Frequencies of flowering seasons

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	April-June	2	9.1	9.1	9.1
	August-November	3	13.6	13.6	22.7
	February-July	1	4.5	4.5	27.3
	February-May	1	4.5	4.5	31.8
	January-December	1	4.5	4.5	36.4
	July- August	1	4.5	4.5	40.9
	July-September	1	4.5	4.5	45.5
	June-August	1	4.5	4.5	50.0
	June-September	1	4.5	4.5	54.5
	March-April	1	4.5	4.5	59.1
	May-June	1	4.5	4.5	63.6
	May-October	1	4.5	4.5	68.2
	November-December	1	4.5	4.5	72.7
	November-February	1	4.5	4.5	77.3
	October-November	2	9.1	9.1	86.4
	September-December	1	4.5	4.5	90.9
	September-November	1	4.5	4.5	95.5
	September-October	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 4. Frequencies of flower colour groups

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	White	16	72.7	72.7	72.7
	Pink, reddish or pale purple	4	18.2	18.2	90.9
	Bright yellow	2	9.1	9.1	100.0
	Total	**22**	**100.0**	**100.0**	

Table 5. Frequencies of flower shoot branching

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Unbranched	12	54.5	54.5	54.5
	Branched (once Branched)	10	45.5	45.5	100.0
	Total	**22**	**100.0**	**100.0**	

The type of growing flowering shoot. The frequency distribution of this trait did not differ, as each had the same frequencies and expressed the same percentages represented by the first character. Two forms of this type of growth are characterized by the previous frequency (which means that the growth continues outside the flowering area). The other form is anauxotelic (meaning that the growth does not proceed outside the flowering area) and the number of replicates 10. It seems here that both qualities are strongly related to the expression of the branches of the branch and the shape of growth Table 6.

The flowering shoot thickness. In this place there were only two shapes, either thick or thin, but the (thin) was in favour of the slave at a high rate of 77.3%. The thickness was just 22.7%. The frequencies and percentages of the representation of the trait are shown in Table 7.

Table 6. Frequencies of flower shoot growing type

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Auxotelic	12	54.5	54.5	54.5
	Anauxotelic	10	45.5	45.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 7. Frequencies of floral thickness

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Thin	17	77.3	77.3	77.3
	Thick	5	22.7	22.7	100.0
	Total	**22**	**100.0**	**100.0**	

Flowering bracket apex. There is a huge difference in Table 8(a) between the two groups, which were differentiated by observable investigation. The group (round) was multiple times over 90.9% contrasted with the other shape (pointed suspended) 9.1%. Similarly, the unopened head of the blossom separated in two shapes, likewise globose and the other looked like a pine cone, (Table 8b).

Flower colour degree. The results of this study are listed in Table 9, and to highlight the divisions and frequencies of this attribute, which has already been talked about and known as three-colours head, but this study is specific colour and detailed list are shown in Table 9. The frequencies were distinct. The pure white

Table 8a. Frequencies of flower bracket apex

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Round	20	90.9	90.9	90.9
	Pointed	2	9.1	9.1	100.0
	Total	**22**	**100.0**	**100.0**	

Table 8b. Frequencies of unopened flower apex

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Globose	20	90.9	90.9	90.9
	Pine cone	2	9.1	9.1	100.0
	Total	**22**	**100.0**	**100.0**	

was repeated two times as well as the cream colour to white at a time when cream colour was repeated 8 times, while the other colours were repeated one time.

Number of flowers in the flowering shoot apex. The number of flowers in the head of syphilis varied widely among species, with the lowest number approximately 47 heads, while the highest number was 375 heads of flowers of the species under study. In some sources, the number reached 450 flowers, (Table 10).

Flower head diameter (mm). There is no uncertainty that the disparity in head measurement between species is focused on because of various cycles of blooming and the ecological conditions and well-being status of the tree, and appropriately the species have been distinguished all things considered prejudicial segregation is prescribed when the way to this tree and the widths went between 6.5 mm - 30 mm, and nearly. The species are totally free in this limit aside from one exemption. The width (17 mm) is re-hashed twice and the two groups of *leucaena* are: *L. collinsii* Britton and *Ample collinsil* Rose and *L. pulverulenta* (Schltdl.) Benth, Table 11.

Table 9. Frequencies of flower colour degree

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Pale cream white	8	36.4	36.4	36.4
	Dull pink	1	4.5	4.5	40.9
	Pale pink	1	4.5	4.5	45.5
	White	2	9.1	9.1	54.5
	Bright yellow	1	4.5	4.5	59.1
	White or cream-white	2	9.1	9.1	68.2
	White or pale crem-white	1	4.5	4.57	2.7
	Pale pink or dull purplish mauve	1	4.5	4.5	77.3
	Crem-white	2	9.1	9.1	86.4
	Bright yellow	1	4.5	4.5	90.9
	Very pale pink	1	4.5	4.5	95.5
	Crem-white	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 10. Frequencies of flowers in flower apex

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	47.50	1	4.5	4.5	4.5
	55.00	1	4.5	4.5	9.1
	67.50	1	4.5	4.5	13.6
	105.00	1	4.5	4.5	18.2
	110.00	1	4.5	4.5	22.7
	112.00	2	9.1	9.1	31.8
	113.00	1	4.5	4.5	36.4
	115.00	2	9.1	9.1	45.5
	120.00	1	4.5	4.5	50.0
	130.00	1	4.5	4.5	54.5
	140.00	1	4.5	4.5	59.1
	142.50	1	4.5	4.5	63.6
	152.50	1	4.5	4.5	68.2
	160.00	3	13.6	13.6	81.8
	165.00	1	4.5	4.5	86.4
	170.00	1	4.5	4.5	90.9
	210.00	1	4.5	4.5	95.5
	375.00	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 11. Frequencies of flower head diameter (mm)

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	6.50	1	4.5	4.5	4.5
	8.50	1	4.5	4.5	9.1
	9.00	1	4.5	4.5	13.6
	10.00	1	4.5	4.5	18.2
	11.50	1	4.5	4.5	22.7
	13.00	1	4.5	4.5	27.3
	14.00	1	4.5	4.5	31.8
	14.50	1	4.5	4.5	36.4
	15.00	1	4.5	4.5	40.9
	16.00	1	4.5	4.5	45.5
	16.50	1	4.5	4.5	50.0
	17.00	2	9.1	9.1	59.1
	17.50	1	4.5	4.5	63.6
	18.00	1	4.5	4.5	68.2
	20.00	1	4.5	4.5	72.7
	21.50	1	4.5	4.5	77.3
	22.50	1	4.5	4.5	81.8
	23.50	1	4.5	4.5	86.4
	25.00	1	4.5	4.5	90.9
	26.50	1	4.5	4.5	95.5
	30.00	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Outer peel thickness. The characteristics of this were very varied 17 times for thick and four times for thin form and just one for Intermediate and have the % 77.2, 18.2 and 4.5, respectively which are shown in Table 12.

Outer peel surface colour. The colour of the outer shell was gray brown and 77.3% repeated 17 times, while the second colour was pale gray metallic 5 times, and 22.7% (Table 13). It is noted that when studying the degree of colour we found that they vary slightly, but all located within the limits of the two colours mentioned above (Table 15).

Outer peel surface fissures. We note that six of the data on this status have not been recorded, which means that 16 types of *leucaena* have been registered. The result of the analysis was characterised by three forms i.e. the vertical orange-brown prominent, near the vertical on the branches of the young and finally the vertical shape on the leg. Repeats were 12, 1 and 3 and 54.5%, 4.5 and 13.6%, respectively, (Table 14).

Inner peel colour. We have not been able to obtain three of the data of this attribute and calculated the calculation of 19 species and almost every type of species under study with its own colour except for a few exceptions as the dark red colour on the old branches and legs 3 times and green colour the same frequency. This is a property that can be added to attributes that can be employed in the work of a comprehensive classification key for these species, (Table 16).

Shape of peel. Although it is difficult to distinguish between species in this characteristic, the statistical analysis showed the recurrence of 7 types and 31.8% linear oblong i.e. rectangular lines, three oblong types and three linear types. The rest of the species were isolated individually, as shown in Table 17.

Table 12. Frequencies of outer peel thickness

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Thick	17	77.3	77.3	77.3
	Thin	4	18.2	18.2	95.5
	Intermediate	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 13. Frequencies of outer peel surface colour

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Mid grey brown	17	77.3	77.3	77.3
	Pale metallic grey	5	22.7	22.7	100.0
	Total	**22**	**100.0**	**100.0**	

Table 14. Frequencies of outer peel surface fissures

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid		6	27.3	27.3	27.3
	Shallow rusty orange brown vertical	12	54.5	54.5	81.8
	Shallow rusty orange brown vertical often exuding young branches	1	4.5	4.5	86.4
	Shallow rusty orange brown vertical on bole	3	13.6	13.6	100.0
	Total	**22**	**100.0**	**100.0**	

Table 15. Frequencies of outer peel colour

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Mid grey brown	4	18.2	18.2	18.2
	Mid grey brown young	1	4.5	4.5	22.7
	Pale silvery grey	1	4.5	4.5	27.3
	Blackish-brown	1	4.5	4.5	31.8
	Mid metallic grey	2	9.1	9.1	40.9
	Mid grey or grey brown	5	22.7	22.7	63.6
	Light grey brown	1	4.5	4.5	68.2
	Pale to mid grey brown	2	9.1	9.1	77.3
	Pale whitish metallic grey	1	4.5	4.5	81.8
	Pale to mid metallic grey	1	4.5	4.5	86.4
	Pale yellow or grey brown	1	4.5	4.5	90.9
	Mid brown	1	4.5	4.5	95.5
	Mid grey brown to dark blackish brown	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 16. Frequencies of inner peel colour

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid		3	13.6	13.6	13.6
	Bright green then deep orange to blood red	1	4.5	4.5	18.2
	Cream	3	13.6	13.6	31.8
	Deep red on older branches and bole	3	13.6	13.6	45.5
	Green	2	9.1	9.1	54.5
	Green and deeper green sometimes streaked pink or reddish	1	4.5	4.5	59.1
	Green then deep blood red	1	4.5	4.5	63.6
	Greenish	1	4.5	4.5	68.2
	Greenish then dark red	1	4.5	4.5	72.7
	Pale cream pink	1	4.5	4.5	77.3
	Slash bright green then deep orange red	1	4.5	4.5	81.8
	Slash cream white	1	4.5	4.5	86.4
	Slash green then cream	2	9.1	9.1	95.5
	Slash pale cream or palr salmon pink	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Outer peel boles. This is classified into four classes according to the characteristic colours of the species, seven recurrences (the highest frequency) of the dark colours, four recurrences of dark gray-brown colour and three repetitions of a light colours, while the rest of the colours are repeated once for the rest of the species but all revolve around the dark brown shown in Table 18.

Outer peel branches. Since these branches are newly developed, or more precisely, they are young and expected to be light colours (smoother), which is predominant here and 16 times more than the total of the 17 species under study. Even though, there was only one type of light to medium gray colour shown in Table 19. There was a high correlation between outer peel thickness and colour with 0.935 in (Table 20).

Table 17. Frequencies of peel shape

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid	Broadly linear	1	4.5	4.5	4.5
	Broadly elliptic or elliptic-ovate	1	4.5	4.5	9.1
	Linear	3	13.6	13.6	22.7
	Linear - oblong to weakly elliptic	1	4.5	4.5	27.3
	Linear or line oblong	2	9.1	9.1	36.4
	Linear-oblong	7	31.8	31.8	68.2
	Obliquely ovate or elliptic	1	4.5	4.5	72.7
	Oblong	3	13.6	13.6	86.4
	Ovate	1	4.5	4.5	90.9
	Ovate-elliptic	2	9.1	9.1	100.0
	Total	**22**	**100.0**	**100.0**	

Table 18. Frequencies of outer peel boles

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid		4	18.2	18.2	18.2
	Rough	7	31.8	31.8	50.0
	Rough darker blackish brown	1	4.5	4.5	54.5
	Rough darker grey brown	4	18.2	18.2	72.7
	Rough mid grey brown to dark blackish brown	1	4.5	4.5	77.3
	Rough, dark blackish brown	1	4.5	4.5	81.8
	Rough, darker blackish brown	1	4.5	4.5	86.4
	Smooth	3	13.6	13.6	100.0
	Total	**22**	**100.0**	**100.0**	

Table 19. Frequencies of outer peel branches

		Frequency	(%)	Valid (%)	Cumulative (%)
Valid		5	22.7	22.7	22.7
	Smooth	16	72.7	72.7	95.5
	Smooth mid grey brown	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Table 20. Correlation matrix between peel items

	Outer peel thickness	Outer peel surface colour	Outer peel boles
Outer peel thickness	1 22	0.935** 22	-0.155 22
Outer peel surface colour	0.935** 22	1 22	-.228 22
Outer peel boles	-0.155 22	-0.228 22	1 22

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