AN OBJECTIVE METHOD FOR COMPARING ALPACA FLEECE DENSITIES

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Fleece density has a major effect on the weight of a fleece and is therefore a desired requirement for the commercial success of an alpaca fibre industry. A grower's ability to estimate the fleece density of breeding stock is essential to improve herd fleece density.

The current objective method for determining fleece density involves taking a skin sample and counting the number of fibre follicles and then expressing the result as so many follicles per square millimetre of skin. The process is invasive, expensive and only useful when comparing densities between alpacas of a similar size and body score.

This new method is not expensive, can be used regardless of alpaca size and can easily be performed by the alpaca owner. It ideally requires the weights (WT) of consistently skirted fleece saddle together with their test results from a midside fleece sample, preferably taken within a couple of weeks before or during shearing. Tests should preferably have been performed using an OFDA2000 instrument with the trim high setting turned OFF. The test results of average fibre diameter (FD), its standard deviation (SD) and the staple length (L) are then used to calculate the average fibre volumes weight (Vw) based on a specific gravity of 1.3.

The saddle weight and average fibre volumes weight are then used to calculate an estimate of the total number of fibres ($Nx10^6$) within the saddle fleece where N equals the weight divided by the average fibre volumes weight (N=WT/Vw).

The value of N is then used in a matrix of FD vs N to allocate an apparent density score out of 10 points. The higher the score, the greater is the apparent density. The matrix has been based on calculated values of N for fleece entries in three national shows (2020 National Fleece Challenge and 2019 and 2018 National Shows). Allowance has been made in the matrix to account for reduced fleece weights resulting from additional skirting requirements as microns increase and alpacas become older. This enables fleeces from the same alpaca over a number of years' to be compared. Although the value of N may decline with age, the apparent density score should remain similar. When the method was applied to a large number of alpacas from the same herd over a number of years, the apparent densities for each alpaca were found to be remarkably stable.

The most reliable estimate of apparent density will be obtained from either the second or third year fleeces. This is because the first year fleece will contain fibres that have not been growing for the same period of time and fleeces after the third year will have started to blow out and require additional skirting.

CALCULATING APPARENT DENSITY

In order to calculate a value for N, it is first necessary to double click on the table shown below. This converts the table into an Excel spreadsheet (You will need to contact the author at mongaalpacas@bigpond.com for an emailed copy of the spreadsheet). The tested values of FD, SD, L and WT for a fleece saddle are then entered into a row below the test fleece. By then copying and pasting the test value in column G to the row below, the spreadsheet will automatically calculate the value of N for this fleece.

The apparent density score for each fleece is then determined by entering the fleece values of N and their FDs into the matrix on the following page. These scores can then be added to the Excel spreadsheet for comparison of fleece densities.

For those readers that are interested, details of the methodology behind this assessment of apparent density can be obtained by contacting the author.

ADVANTAGES

- It is an assessment of density based on the number of fibres in a fleece rather than a subjective assessment based on feel and appearance.
- It is an objective assessment based on tested values for weight, micron, SD and average length.
- It can be used to compare fleece densities from alpacas of different sizes and body scores.
- It is not affected by differences in environmental conditions between different years and properties.
- The scores make allowances for increased skirting requirements on weight with increasing fleece microns as alpacas age.

- It will still produce acceptable values for comparison if all tests are carried out using the OFDA2000 trim high setting turned ON. Extreme differences between the ON and OFF values for SD will however result in higher values of N with the lower trim ON value of SD.

LIMITATIONS

- The method assumes that the entered fleece weights are for consistently skirted fleece and that areas such as neck or leg fleece are not included.
- The method assumes that fleeces with microns below 23 require minimal skirting. A dense fleece requiring considerable skirting may have a similar weight to another fleece of a similar micron that is not as dense and required minimal skirting. Neither however, would compare with a heavy fleece that was both dense and required minimal skirting.
- Medullation results in reduced values for WT but does not affect the calculation for V and these lower weights produce lower values for N. This however can have a positive effect on scores since it rewards those fleeces that have low levels of medullation for any one micron.
- Because consistent skirting requirements have been accounted for in the scoring process, minimal or excessive skirting will result in either higher or lower values for N. This is not necessarily a disadvantage since it acknowledges the extent of fleece uniformity across the saddle area.
- It will not produce consistent results for different fleeces from the same alpaca if any one fleece requires abnormally excessive skirting as a result of contaminants, poor shearing or large changes in the extent of medullation.
- It may not give reliable results for fleece from alpacas that are older than about 6 years due to the potential for excessive medullation. Coarse straight fibres with diameters over about 40µ will be fully medullated and this may represent some 60% of these fibre volumes.
- It will not give reliable results for first year fleeces since not all fibres will have been growing for the same period of time.

EXCEL SPREADSHEET FOR CALCULATING NUMBER OF FIBRES (N)

PROPERTY	ALPACA	FD µ	SD µ	SL mm	WT kg	$Nx10^6$	DENSITY SCORE
	Test	20	4	90	2.5	66	10

FLEECE MICRON vs NUMBER OF FIBRES (Nx10^6)

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APPARENT DENSITY SCORE

MICRON	10	9	8	7	6	5	4	3	2	1
12.6-22.5	70-65	64-59	58-53	52-47	46-41	40-35	34-29	28-23	22-17	16-11
22.6-23.0	69-64	63-58	57-52	51-46	45-40	39-34	33-28	27-22	21-16	15-10
23.1-23.5	67-62	61-56	55-50	49-44	43-38	37-32	31-26	25-20	19-14	13-8
23.6-24.0	66-61	60-55	54-49	48-43	42-37	36-31	30-25	24-19	18-13	12-7
24.1-24.5	64-59	58-53	52-47	46-41	40-35	34-29	28-23	22-17	16-11	10-5
24.6-25.0	63-58	57-52	51-46	45-40	39-34	33-28	27-22	21-16	15-10	9-5
25.1-25.5	61-56	55-50	49-44	43-38	37-32	31-26	25-20	19-14	13-8	7-5
25.6-26.0	60-55	54-49	48-43	42-37	36-31	30-25	24-19	18-13	12-7	6-5
26.1-26.5	58-53	52-47	46-41	40-35	34-29	28-23	22-17	16-11	10-5	
26.6-27.0	57-52	51-46	45-40	39-34	33-28	27-22	21-16	15-10	9-5	
27.1-27.5	55-50	49-44	43-38	37-32	31-26	25-20	19-14	13-8	7-5	
27.6-28.0	54-49	48-43	42-37	36-31	30-25	24-19	18-13	12-7	6-5	
28.1-28.5	52-47	46-41	41-35	34-29	28-23	22-17	16-11	10-5		
28.6-29.0	51-46	45-40	39-34	33-28	27-22	21-16	15-10	9-5		

NUMBER OF FIBRES (Nx10^6)