



IAC Fleece Sample Measurements & Expected Progeny Differences

The Ideal Alpaca Community (IAC) manages the collection of fleece sample data on behalf of its members and coordinates the analysis and reporting of Expected Progeny Differences (EPDs). The information is publicly displayed on the IAC website (www.ideal-alpaca.com) for each alpaca that qualifies, provided the owner enables the display. Table 1 is an example of the EPD and Histogram information for a single alpaca.

The IAC established a standard set of fiber related measurements (Histograms) that are the basis for calculating EPDs. In 2007, the number of standard measurements increased from four to eleven, plus Total Fleece Weight. Yocom-McColl Testing Laboratories, Inc. performs actual fiber measurements. The results are reported back to the owners, and also merged into the IAC EPD database. Dr. David Notter, Professor of Animal Science, Virginia Polytechnic Institute and State University, computes EPDs annually for the Ideal Alpaca Community. Because EPDs are updated based on the entire database of accumulated fiber measurement data, they are reported only for the most recent EPD analysis. Table 1 reflects the 2007 clip and reports EPDs only on "Mean Fiber Diameter" and "Total Fleece Weight" for Huacayas. In the spring of 2009, the results of the 2008 clip will be available. Reports will include additional EPDs for "Fiber > 30 microns", "Mean Staple Length", and "Mean Curvature". Results for Suris will also be included. Over the next few years, each column in Table 1 will contain EPDs.

Table 1. Fiber measurement information for a single alpaca. Chart taken from the Ideal Alpaca Community website. EPDs are shown in the upper portion of the table and fiber measurements (Histogram data) are in the lower section.

PRODUCTION HISTORY												
Year	Mean Fiber Diameter	Deviation	Coefficient of Variation	Spin Fineness	Fibers > 30 Microns	Medullated Fibers	Mean Staple Length	Length Std Deviation	Length C of V	Mean Curvature	SD Curvature	Weight
	µm	µm	%	µm	%	%	mm	mm	mm	%mm	%mm	lbs.
EPD												
EPD	-1.1											0.5
PE	0.4											0.29
#Tested	23											23
Histogram												
2008	25.31	5.55	21.94	24.84	14.75	36.81	68	5.57	8.19	38.24	27.12	7.2
2007	28.88	6.65	23.02	28.62	30.94	64.62	78	3.24	4.15	31.77	20.11	9.0
2004	28.2	6.4	22.9		27					32.7	20.2	
2003	28	6.2	22.2		26.3							
2002	28.4	6.1	21.5		27.9							
1998	22	4.8	21.8		4.5							
1997	22.1	4.4	19.9		5.1							
1996	19.5	4.3	22.1		3							

Glossary of Fleece Trait Measurement Terms

Each fiber trait measurement is keyed to the red numbers in the column heading. For now, there are only two EPD measurements available. Several more EPDs will be added in the spring of 2009. Ultimately, all columns will have EPD entries. Complete sets of Histogram measurements are available only for 2007 and later. Prior to 2007, only four measurements were typically reported.

PRODUCTION HISTORY												
Year	1 Mean Fiber Diameter µm	2 Deviation µm	3 Coefficient of Variation %	4 Spin Fineness µm	5 Fibers > 30 Microns %	7 Medullated Fibers %	6 Mean Staple Length mm	8 Length Std Deviation mm	9 Length C of V mm	10 Mean Curvature %/mm	11 SD Curvature %/mm	12 Weight lbs.
EPD	-1.1											0.5
PE	0.4											0.29
#Tested	23											23
Histogram												
2008	22.93	3.72	16.22	21.49	4.52	7.88	141.6	8.56	6.05	33.83	18.67	8.7

- 1) **Mean Fiber Diameter (MFD)**, also called “**Micron Count**“, **22.93** microns. This indicates the average diameter of the fibers tested. One micron equals 1/1,000,000th of a meter, or 1/25,400th of an inch. The lower the Mean Fiber Diameter, the finer the fiber, and normally the more valuable it is.
- 2) **Standard Deviation (SD)**, **3.72** microns. This is a measure of variability of the fiber diameter. It means that approximately 33% of the fibers measured are 3.72 microns greater than the mean and 33% are less than the mean. Another way of stating this is about 67% (±33.3%) of the sampled fibers are within ±3.72-microns of the mean. The lower the SD, the more uniform the sample. A low standard deviation is a desirable fiber characteristic.
- 3) **Coefficient of Variation (CV)**, **16.22** percent. This is another method of measuring variability that is independent of mean fiber diameter. It is the standard deviation (SD), divided by the mean fiber diameter (MFD), expressed as a percentage.
 Example: $CV = (SD \div MFD) \times 100 : 3.72 \div 22.93 = .162 \times 100\% = 16.22\%$
- 4) **Spin Fineness (SF)**, **21.49** microns. This number provides an estimate of the performance of the sample when it is spun into yarn. It combines the measured mean fiber diameter (MFD) and the measured coefficient of variation (CV). The formula used comes from Butler and Dolling and normalizes the equation so that the spin fineness is the same as the MFD when the CV is 24%.

- 5) **Fibers > 30 Microns** ($\%>30\mu$), **4.52** percent. This is an indicator of how comfortable a garment is likely to be when made from the tested fiber. This measurement is also called **Prickle Factor**. Garments made with fabric containing more than 5% over 30 microns fiber tend to itch when worn next to the skin. **Fibers > 30 Microns** is calculated as the percent of fibers measured over 30 microns, relative to all the fibers in the tested sample.

Another measurement, **Comfort Factor** also reflects the percentage of course fibers.

Example: Comfort Factor: $100\% - (\%>30\mu) = 100\% - 4.52\% = 95.48\%$.

- 6) **Medullated Fibers**, **7.88%**. This is an indicator of fiber quality important in fiber processing, fabric appearance and comfort. It is calculated as the proportion of medullated fibers, relative to all the fibers in the tested sample, expressed as a percentage. A medullated fiber is an animal fiber that in its original state includes a medulla. A medulla in mammalian hair fibers is the more or less continuous, air-filled, cellular marrow inside the cortical layer in some alpaca fibers. For technical reasons, use of the OFSA 100 to estimate medullation is limited to white or pastel colored fleeces.

Medullated Fibers are sometimes referred to incorrectly as a “guard hair”. Alpaca **Guard Hair** is an opaque hair that is very stiff and sometimes medullated. To the extent its medullation can be detected, guard hair is included in the Medullated Fibers measurement. Also, because it is typically very coarse, most guard hair is included in **Fibers > 30 Microns** measurement. Medullated fibers take dye unevenly.

- 7) **Mean Staple Length** (MSL), **141.6** mm or 5.5748 inches. Mean Staple Length is the average length of the fibers contained in the sample. The measurement is adjusted to an annual growth period so that measurements are comparable with other alpacas irrespective of the time duration between shearings. Within reason, the longer the staple length, the more desirable the fiber. There are problems with processing excessively long fiber.
- 8) **Length Standard Deviation** (LSD), **8.56** mm. This is a measure of staple length variability. It indicates that 34 percent of the fibers measured are 8.56mm longer than the mean, and 34 percent are shorter than the mean. Sixty-eight percent of the measurements in a normal distribution lie within the first standard deviation of the mean. A low value indicates a uniform fleece length and is more desirable than a high one.
- 9) **CV Length**, or more appropriately, **Co-efficient of Variation of Staple Length** (LCV), **6.05%**. This is another measure of staple length variability. The LCV equals LSD divided by the MSL, expressed as a percentage. A low value indicates a uniform fleece length and is more desirable than a high one.

Example: CV Length: $LSD \div MSL \times 100\% = 8.56 \div 141.6 \times 100\% = 6.05\%$

10) **Mean Curvature**, also referred to as **Mean Fiber Curvature (MFC)**, **33.83** degrees per mm. This measurement directly correlates to **Crimp**. Crimp is often regarded as an indicator of fiber fineness in Huacayas. Higher crimp is also preferred by some fiber processors because it can yield lighter weight, bulkier garments. This sample shows a mean curvature of 33.83 deg/mm. Mean Fiber Curvature (MFC) is determined by the measurement of two millimeter (2mm) snippets in degrees per millimeter (deg/mm). The greater the number of degrees per millimeter, the tighter the crimp. Crimps per inch can be computed by multiplying MFC in deg/mm by 0.07056.

Example: Crimp: Mean Fiber Curvature x 0.07056 = 33.83 x 0.07056 = 2.387 crimps/inch

For wool, low curvature is described as less than 50 deg/mm, medium curvature as the range of 60-90 deg/mm, and high curvature as greater than 100 deg/mm. For alpacas, many consider higher values of Mean Fiber Curvature better. Increased fiber curvature can make alpaca appear more like wool. Alpacas on average have much lower crimp than wool (high crimp in an alpaca is 7 to 10 crimps/inch and for wool high crimp is more than 20 crimps/in).

11) **SD Curvature** also called **Standard Deviation of Curvature**, **18.67** degrees per mm. This indicates the variability in the curvature within the sample analyzed. This means that one-third of the fibers measured were 18.67 deg/mm higher than the mean curvature and one-third are below the mean curvature. A lower value implies more uniformity and is preferred.

12) **Weight**, **8.7** lbs, is the actual **Total Fleece Weight** measured at the time of shearing, as recorded by the farm owner. Total Fleece Weight includes the entire fleece, including fiber from blanket, neck, belly and legs. In the Histogram portion of Table 1, total fleece weight is *not* adjusted to reflect one year's growth. If the previous shear date was more than one year prior, this weight indicates more than one-year's fiber growth. However, in the EPD portion of the table, fleece weight *is* adjusted for annual growth.