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INTERLABORATORY TEST PERFORMANCE OF A PORTABLE FIBER TESTER

EC. Quispe[1,4*], MJ. Rubio[1], AV. Bustinza[1], D. Sacchero[2] and MD. Quispe[3]

[1]National Autonomus University of Chota, Street José Osores 418, Chota, Cajamarca, Perú.
[2]Textile Fibers Laboratory. National Institute of Agricultural Technology. Bariloche. Argentina.
[3]Maxcorp Technologies S.A.C. 855 Los Ruiseñores Street. Office 403. Santa Anita. Lima.Perú.
[4]Natural Fiber Tech S.A.C. 796 Felipe de Zela Street. Office 302. Santa Anital, Lima, Perú.
edgarquispe62@gmail.com

Fiber diameter is a principal factor of the wool quality determination for fleece production, wool trading, and textile processing. Therefore, it is important to measure fiber diameter of wool samples with a high accuracy, precision and speed-fastness. Currently there are a few instrument in use to measure fiber diameter of either greasy and clean wool samples at wool center laboratory and warehouse, however, those were lack of portability, price affordability, measurable limitation, and inflexibility of field use on farms. So, the objective of this research was to construct a portable fiber tester (PFT) and provide an alternative fiber testing device for field use. The design and construction of a PFT was implemented at Autonomus National University of Chota, and Maxcorp Technologies SAC of Lima, Peru. The international standard wool top samples were obtained and used for validation measurement of fiber diameter and other wool characteristics using PFT comparatively. Fiber characteristic test performance accuracy and precision values were evaluated by inter-laboratory test performance studies. The interlaboratory tests were conducted in three labs in Peru. However, these tests were performed in the conventional laboratory setting without a restrict temperature or humidity control. Eight international standard wool tops each with three subsamples were measured simultaneously. Data were analyzed following the statistical procedure of R v 3.5.2. Linear model with three factors including effect of lab, sample, and subsample were used to derive the least square means.. In addition, variance components were determined. The test precision was determined using a standard deviation and confidence of interval calculated of same sample measures. Whereas, test accuracy was assessed using deviation of measures which obtained with PFT from data reference of standard wool top measurement values. The new design of PFT has a feature of compact size and light weight. PFT was operated with a digital image capture and analytical program that adapted from the methodology developed by Deng and Ke (2010)[1], which measures the fiber diameter values and captures digital data for per sample in 45 seconds. The results show that the average fiber diameter measured by PFT at all labs and each individual lab are within IWTO tolerance values (Figure 1) with a high precision and accuracy. These were in agreement with the previous validation of Quispe *et al.* (2018)[2]. There were no significant lab effect in this investigation whereas, variance of labs were remained low although these tests were performed under a varied condition of humidity or temperature. According to these results, it can be concluded that PFT is an instrument with a high precision and accuracy to measure fiber diameter of wool, which may be operated in different ambient environmental conditions.

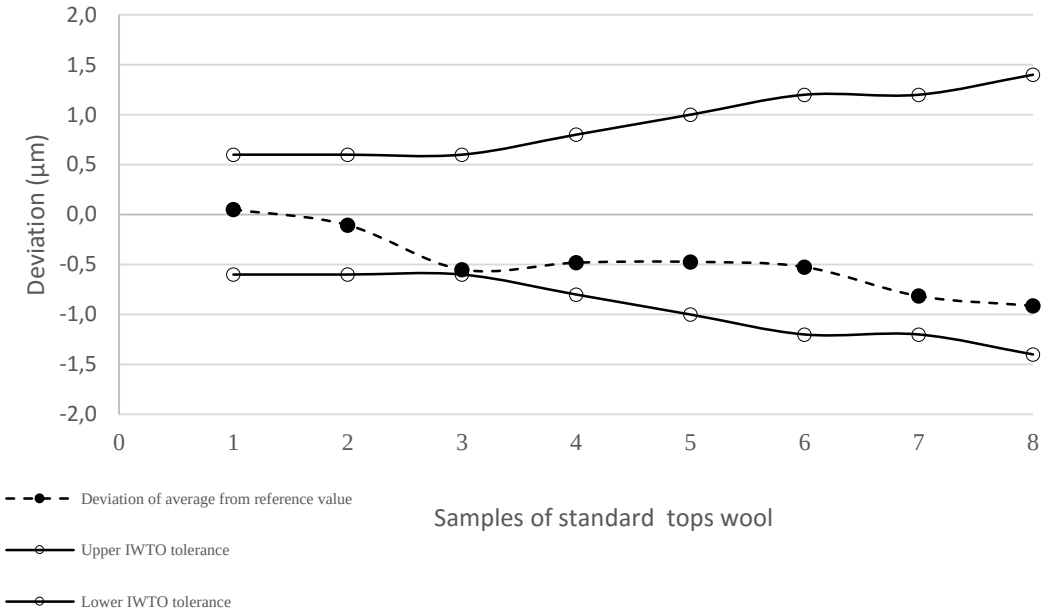

Figure 1: Deviation of average fiber diameter of three labs from reference value of each of eight standard wool tops according IWTO tolerance

[1] Z. Deng, W. Ke, *In Signal Processing Systems (ICSPS), 2nd International Conference on*. **2010**, 2: 587-590.
[2] E.C., Quispe, D.Sacchero, M.D. Quispe, *Rev Invest Vet Peru*. 2018, 99, 18 – 22. (in Spanish, English abstract).