The American Journal of Interdisciplinary Innovations and Research (ISSN–2642-7478)
Published: May 31, 2021 | **Pages:** 94-99
Doi: https://doi.org/10.37547/tajiir/Volume03Issue05-17

IMPACT FACTOR 2021: 5. 676
OCLC - 1091588944

Mathematical Modeling Of Moisture Properties Of Terry Tissue

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ABSTRACT

This study, designed to design and predict the water-related properties of pili tissue, mainly analyzed the linear density, pili height, and density of pili properties using a mathematical model using a full-factor experimental method. The article developed a mathematical model of the water absorption and construction properties of piliy textiles and correlated them with the results of practical experiments.

KEYWORDS

Terry, water distribution radius, water permeability, pili density, pili height, mathematical model.

INTRODUCTION

Towels are the most commonly used textile product when using terry woven fabrics with water. Users prefer ready-made gowns, towels to be comfortable and fresh, made of light and

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soft construction, to absorb water and sweat accumulated in the body, to dry quickly, to be hygienic and natural. Therefore, convenience for textiles is also an important need for terry fabrics in relation to water [1-4]. The hygroscopic properties of towel products are characterized by their ability to absorb and absorb moisture. We took 18 different samples of woollen fabrics and measured them as the desired parameter by measuring the number of pili strands, the number of loops, the length, thickness and surface density of the 1 cm loop thread [5-9]. Using the obtained unwanted parameters, we constructed a mathematical model to predict the properties of the High Surface Moisture Time and the High Surface Moisture Absorption Level Predictability. Table 1 shows a mathematical model of the high surface wetting time of woollen fabrics and provides a model calculation.

X_1- Linear density of feather yarn, Ne.
X_2- Number of pili rings in 1 cm^2.
X_3- Length of pili strip in 1 cm^2, (cm).
X_4- Thickness, (mm).
X_5- Surface density, (g /10 cm^2).
Y_1- High surface wetting time, (s).
Y_2- High surface moisture absorption treatment, (% S).

Table 1. Mathematical model matrix of high surface wetting time and level.

Namuna	Linear density of feather yarn, Ne	Number of pili rings in 1 cm^2	Length of pili strip in 1 cm^2, (cm)	Thickness, (mm)	Surface density, (g /10 cm^2)	High surface wetting time, (s)	High surface moisture absorption treatment, (% S).
	X_1	X_2	X_3	X_4	X_5	Y_1	Y_2
1	27/1	48	51,4	3,92	4,97	6,46	49,80
2	27/1	48	50,4	4,78	4,99	6,78	48,58
3	27/1	48	49,0	4,25	5,07	5,68	48,65
4	27/1	42	49,1	3,04	3,63	16,29	24,12
5	27/1	42	48,3	3,04	3,66	17,26	23,98
6	27/1	42	48,7	3,02	3,69	16,89	24,15
7	36/2	48	79,7	3,03	3,69	1,31	19,93
8	36/2	48	81,6	3,07	3,68	2,35	19,26
9	27/1	72	79,9	2,81	3,65	1,98	20,21
10	27/1	72	80,6	3,08	3,68	23,21	31,95
11	27/1	72	80,6	3,35	3,76	22,90	30,25
12	27/1	64	58,2	3,40	3,73	22,96	32,52
13	27/1	64	58,9	3,44	4,70	5,34	24,83
14	27/1	64	58,2	3,30	4,64	6,15	24,56
15	36/2	56	46,5	3,30	4,67	5,89	25,01

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16	36/2	56	47,6	3,41	3,98	71,51	7,55
17	36/2	56	45,9	3,16	4,00	70,27	7,85
18	36/2	56	45,9	3,16	3,98	70,59	7,26

Y_1- We construct the model using regression analysis to calculate the high surface wetting time (s). This model allows you to calculate the absorption time of a drop of water-based on 5 input factors and has the following appearance.

Y_1- High surface wetting time, (s).

$Y_1=83,12+0,58*X_1+1,47*X_2-1,5*X_3+26,05*X_4-40,49*X_5$

Y2- High surface moisture absorption treatment, (% S).

$Y_2=-30,869-0,3*X_1-0,33*X_2+0,35*X_3+11,84*X_4+6,81*X_5$

RESULTS AND DISCUSSION

The main purpose of mathematical modelling is to predict and predict the expected properties of products. We knitted towels of different compositions, took samples from them and took the measured parameters as an unwanted parameter[10-15]. Using the obtained unwanted parameters, we predicted the water absorption rate and water absorption time of our products [16-26].

Table 2. Analysis of the values of high surface wetting time and high surface moisture absorption properties determination models.

Sample	High surface wetting time, (s)		High surface moisture absorption treatment, (% S).	
	Practical	Model value	Practical	Model value
1	6,46	6,86	49,80	43,43
2	6,78	16,08	48,58	53,35
3	5,68	1,30	48,65	47,11
4	16,29	19,19	24,12	25,06
5	17,26	19,32	23,98	24,98
6	16,89	16,89	24,15	25,14
7	1,31	5,42	19,93	20,57
8	2,35	3,97	19,26	21,67
9	1,98	10,10	20,21	23,30
10	23,21	14,78	31,95	27,02
11	22,90	18,63	30,25	30,79
12	22,96	42,87	32,52	25,90
13	5,34	4,10	24,83	33,25

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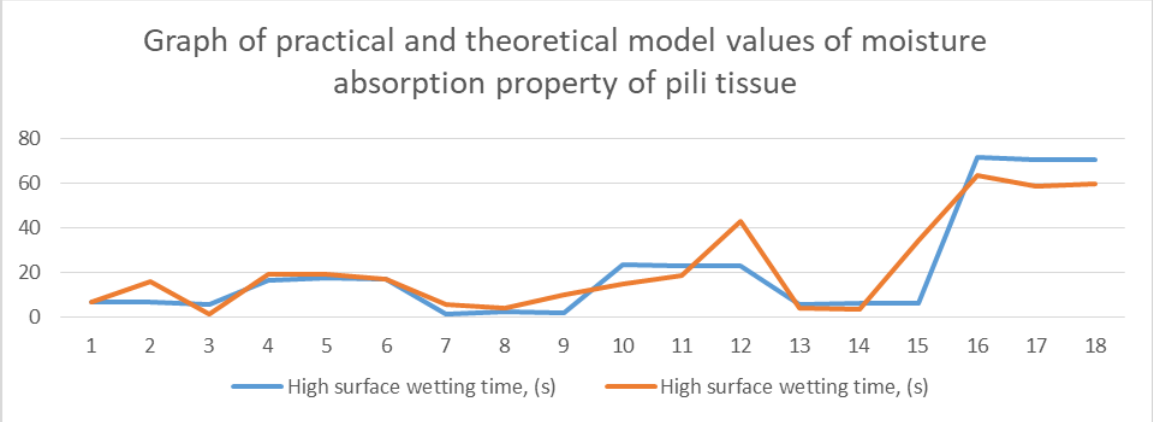
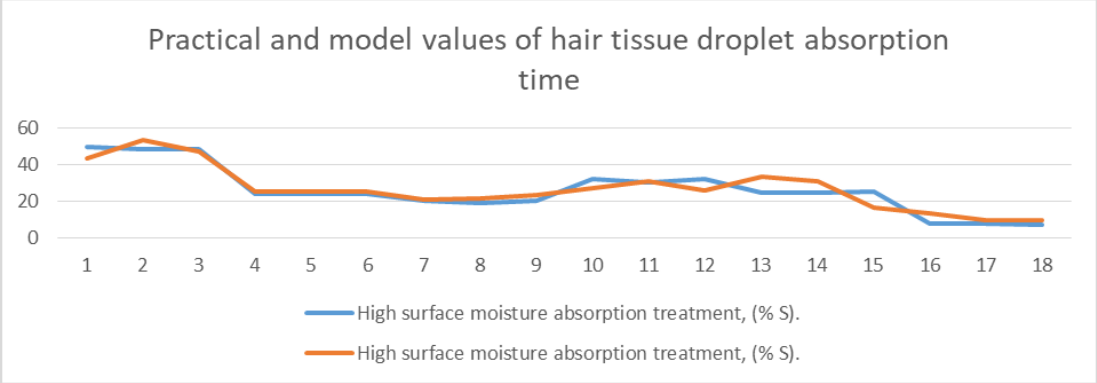
14	6,15	3,69	24,56	30,88
15	5,89	34,38	25,01	16,25
16	71,51	63,45	7,55	13,23
17	70,27	58,62	7,85	9,80
18	70,59	59,72	7,26	9,62



1-graph. Practical and model values for the time of absorption of pili tissue.



2-graph. Graph of practical and theoretical model values of moisture absorption of pili tissue.

CONCLUSION

The values of the mathematical model are compared with the practically obtained values in the graphs above. The graphs show that the values of these properties calculated from the model and the values measured from the finished product samples are very close to each other.

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