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THE CORRELATION BETWEEN ABSORPTION OF WATER AND MOISTURE CONTENT WITH DURATION OF BLACK AND WHITE SOYBEAN SEEDS.

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ABSTRACT

The physical properties of soybean are important in designing and fabricating equipment and structures for handling, transporting, processing and storage and also for assessing the quality of soybean. The study conducted to investigate the soybean at different time duration. The average length, width and thickness of white soybean were 6.47 mm, 5.724 mm and 4.466 mm respectively on day 0. The average length, width, and thickness of black soybean were 6.51 mm, 5.28 mm and 4.16 mm respectively on day 0. Moisture content of white soybean increased from 3.06 %, 43.19 %, 58.54 %, 61.83 %, 57.04 % and 56.31 % on day 0,1,2,3,4 and 5 respectively whereas the corresponding total solids decreased from 96.93 %, 59.8 %, 41.45 %, 38.16 %, 42.95 % and 43.46 % for day 0,1,2,3,4 and 5 respectively. Moisture content of black soybean increased from 4.08 %, 52.99 %, 58.11 %, 54.56 %, 55.42 % and 57.89 % whereas the corresponding total solids decreased from 95.91 %, 47.0 %, 41.88 %, 45.43 %, 44.57 % and 42.1 % on day 0, 1,2,3,4, and 5 respectively.

Keywords: Moisture content, Physical properties, White soybean, Black soybean.

INTRODUCTION

Soybean, being less expensive, but rich source of good quality 40 % protein and 20 % fat, has been recognized as a vital ingredient for protein enrichment for ready to eat food product (Kulkarni, 1994). Pandya, A.P. (2014).states that hulled black soybean is a very good source of proteins, carbohydrates, fibers and other components that affect in cholesterol reduction and have anti carcinogenic effects. In specialty soy food products, including edamame, natto, miso, and tofu, seed size and shape are important qualities (Salas 2006). Round seed is

frequently pleasurable for food-type soybean, while desirable seed size ranges from large, for tofu and miso, to small, for natto production (Wilson, 1995). The large seed was more uniform in shape than the small seed (Sakai and Yonekawa, 1991). Some natto products were made from seed size 5.0 to 5.5 mm. Colour and size consistency are key grading factor for soybeans that verify the value of the crop, especially for food-type soybeans (CGC, 2004).Perry (1980) reported that there is a close correlation between seed size and seed nutritional resources, therefore it is expected that an increase in seed size has a positive role in seedling growth and subsequently increasing the seed yield . Medium seeds had the highest amount of germination parameters between the different seed sizes of soybean because soybean is a oily crop and the increasing of seed weight from medium seed size, can cause to the oxidative stress due to the oily components.

MATERIALS AND METHOD

Sampling: Black and white soybean were purchased from the Madhya Pradesh and brought to laboratory in polythene bag for whole investigation. The samples were cleaned manually to remove foreign materials, broken and immature soybeans. The samples were kept in water for 5 days for the moisture to distribute uniformly throughout all the seeds. Before each test, the required quantity sample was taken out and allowed to keep at room temperature.

Physical properties

In order to determine dimensions, 20 soybeans (black and white) were randomly selected based on healthy look. For each soybean the three principle dimensions namely length, width and thickness were measured using micrometer **SCREW GAUGE** with least count of 0.001, at each day. The Length (L) was measured from the tip cap to Kernel crown. Width (w) identify as the widest point to point measurement parallel to the face of the Kernel. Thickness was measure the distance between the two kernels faces as described by Pordesimo et.al. (1990).

Geometric Mean Diameter

GMD of black and white soybean seed sample were measured using micrometer screw gauge with least count of 0.001, Geometric mean of the spatial dimensions (length, breath and thickness was calculated as: $(L \times B \times T)^{1/3}$. Where L is the length, W is the width and T is the thickness in mm.

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Sphericity

The Sphericity Φ is calculates using the formula:

$$\phi = \frac{(LWT)^{\frac{1}{3}}}{L}$$

Moisture Content

Moisture content of soybean samples (black and white) was determined (105 ^{0} C) by using oven method. (AOAC,1990).

$$\text{Moisture Content in\%} = 100 \times (Intialweig\ ht - Ovendrywei\ ght \Big/ Ovendrywei\ ght$$

$$\text{Total Solids in \%} = 100 \times (Ovendrywei\ ght) \Big/ Intialweig\ ht$$

Grain Mass

The grain mass was find out using the electronic balance having an accuracy of 0.001 g.

RESULT AND DISCUSSION

The result of soybean size and mass at different time duration (in days) are shown in Table 1. All the dimensions increased with time duration from day 0 to day 5. The result indicate that the soybeans (black and white) increased in length, width, thickness, sphericity and geometric mean diameter within the time duration from day 0 to day5. Grain mass also increases with time duration. On day 5, the highest increased in length were observed in black soybean (11.59 mm). On day 5, the highest increased in width, thickness, difference in weight, total solids, geometric mean and sphericity were observed in white soybean about 7.29 mm, 5.16 mm, 3.09 g, 43.46 %, 7.55 and 0.659 respectively. There were great difference observed in increase in length, width, moisture content and difference in weight in both black and white soybean from day 0 to day 1. Sphericity was highest recorded in day 2 in black (1.536) and white soybeans. (1.566). this shows that their shape approaches that of the sphere. Sahoo and Srivastava (2002) reported an initial increase followed by a decrease in sphericity for okra seed, which was attributed to proportional increase in length, width and thickness.

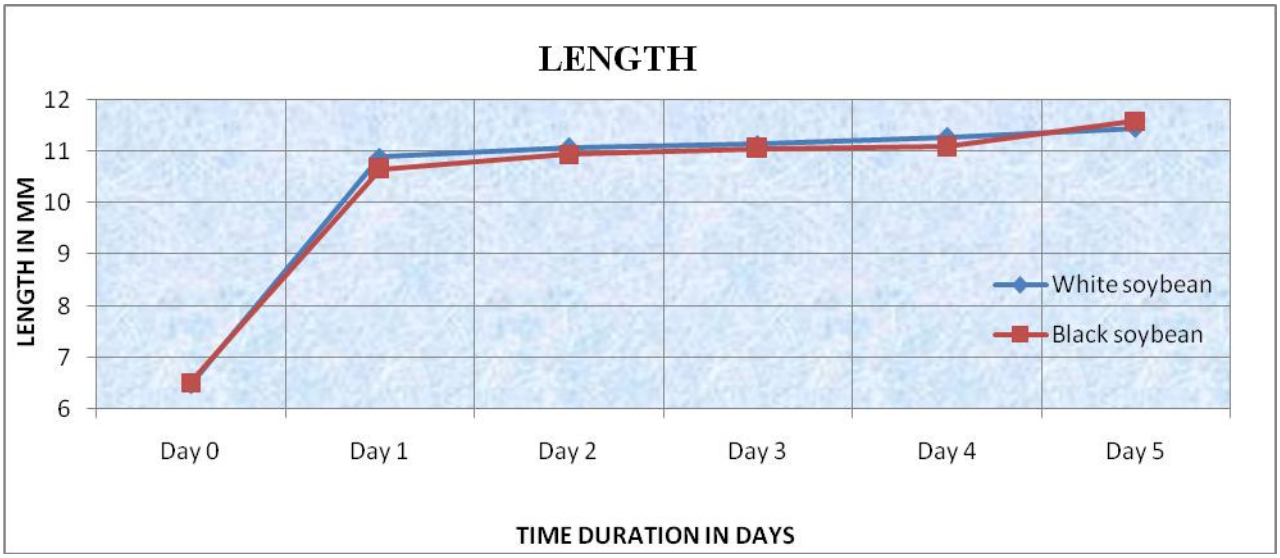

Figure 1: Showing the Length vs. time duration in days (Black and white soybean)

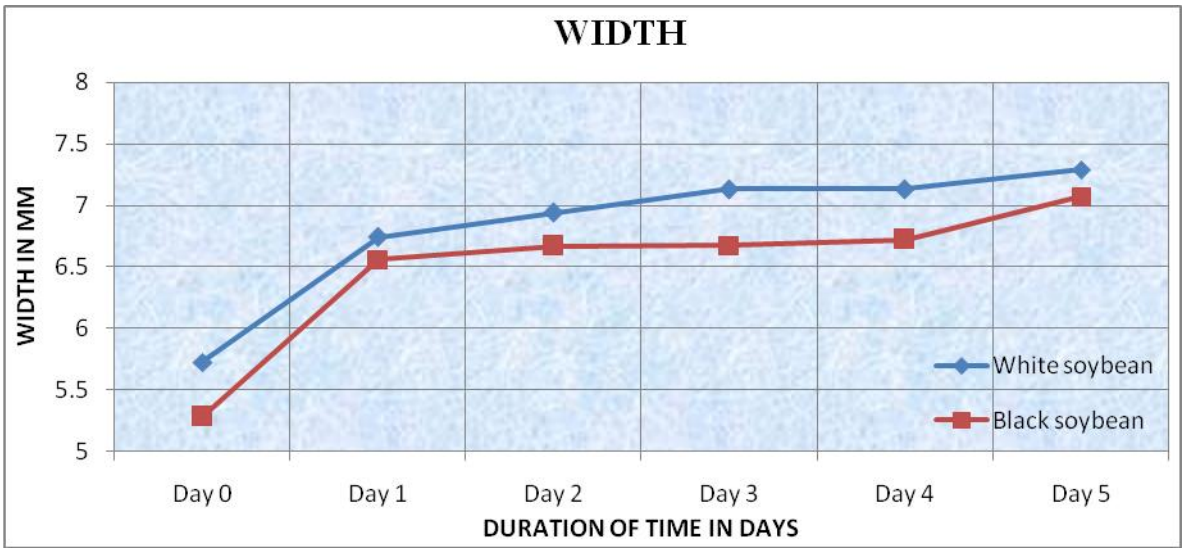

Figure 2: Showing the Width vs. time duration in days (Black and white soybean)

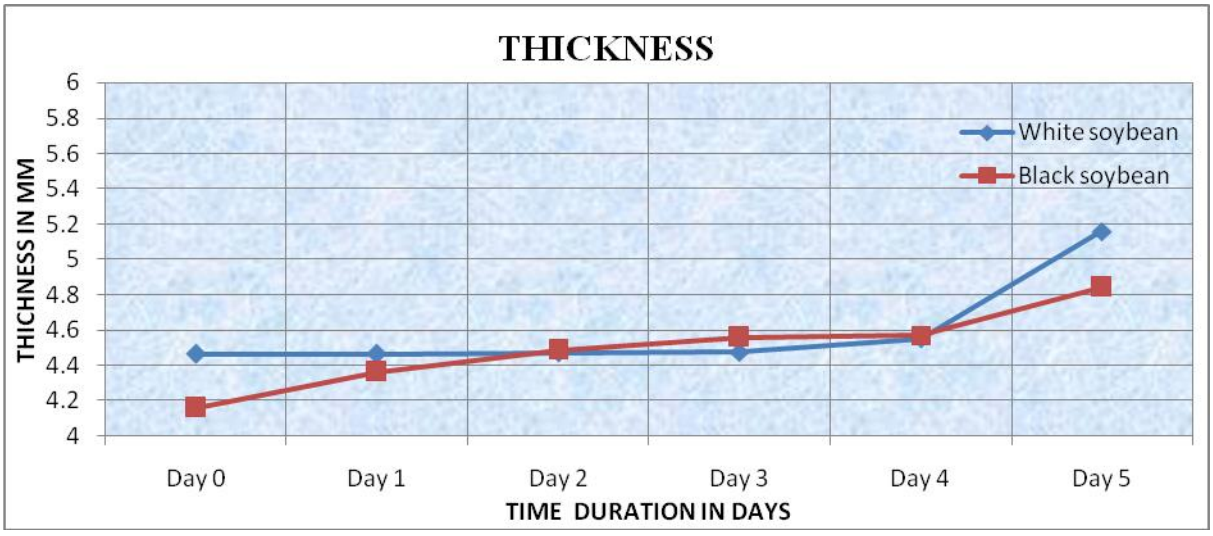

Figure 3: Showing the thickness vs. time duration in days (Black and white soybean)

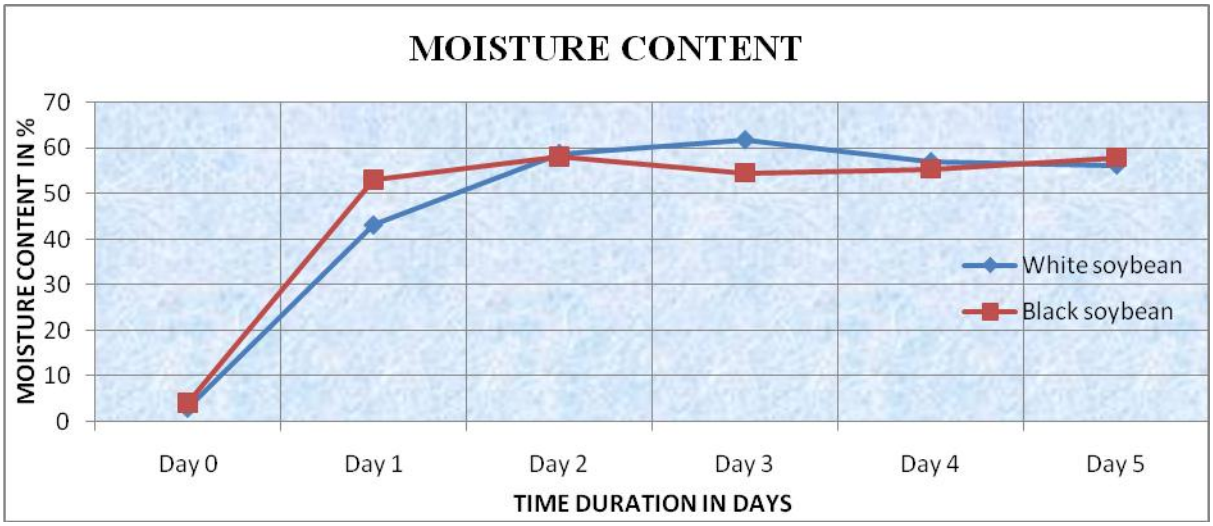

Figure 4: Showing the Moisture Content vs. time duration in days (Black and white soybean)

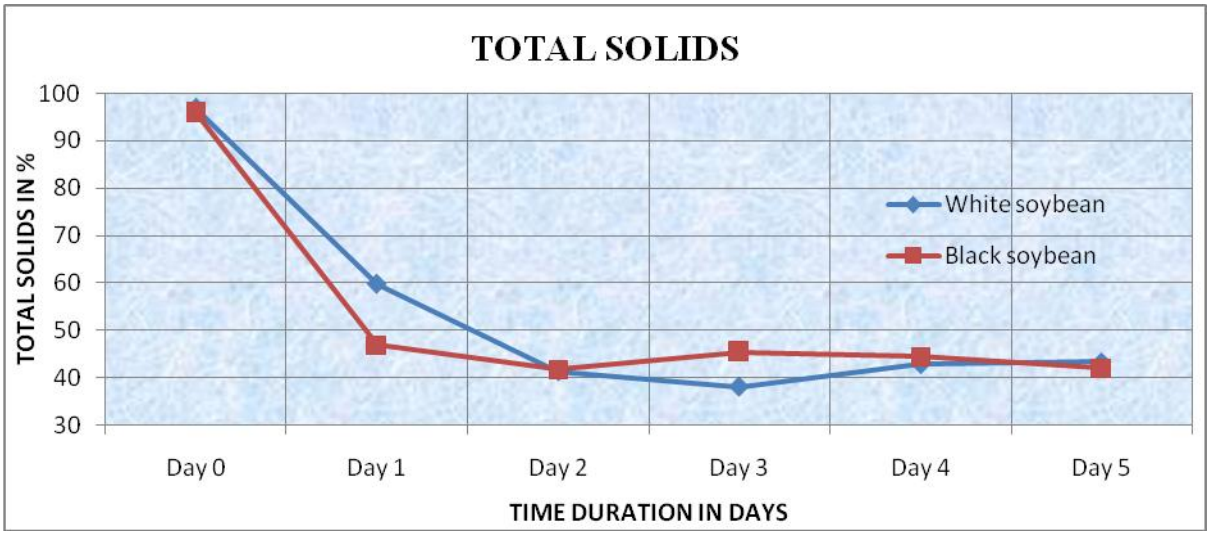

Figure 5: Showing the Total Solids Content vs. time duration in days (Black and white soybean)

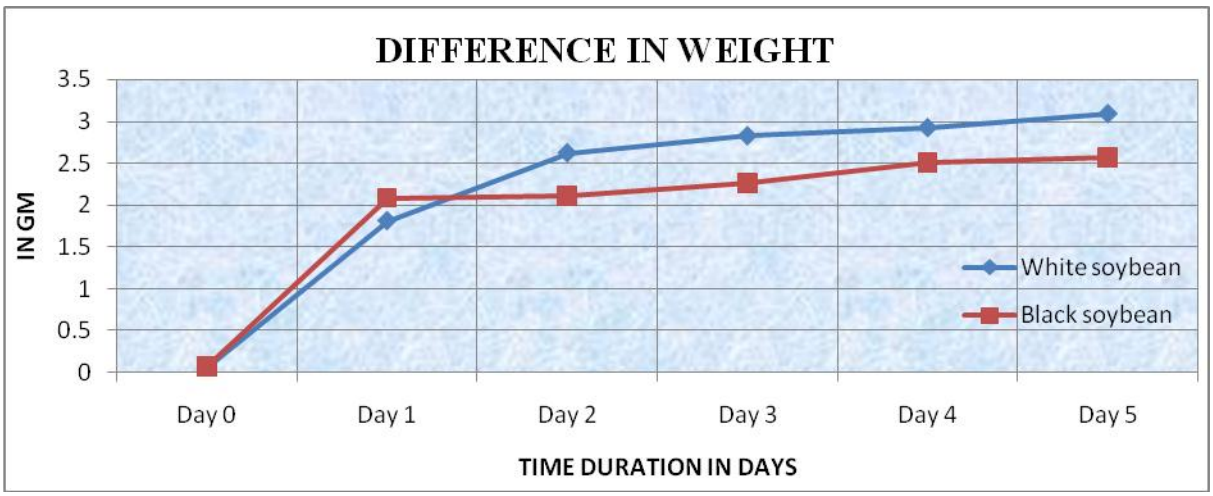

Figure 6: Showing the difference in weight vs. time duration in days (Black and white soybean)

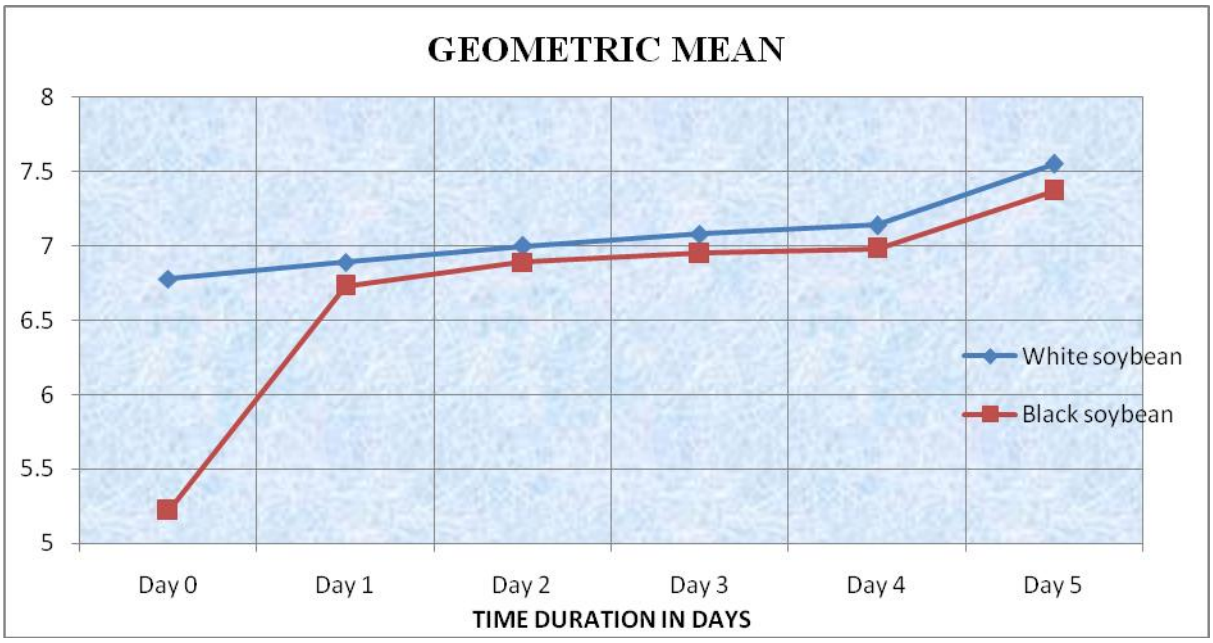

Figure 7: Showing the Geometric Mean Diameter vs. time duration in days (Black and white soybean)

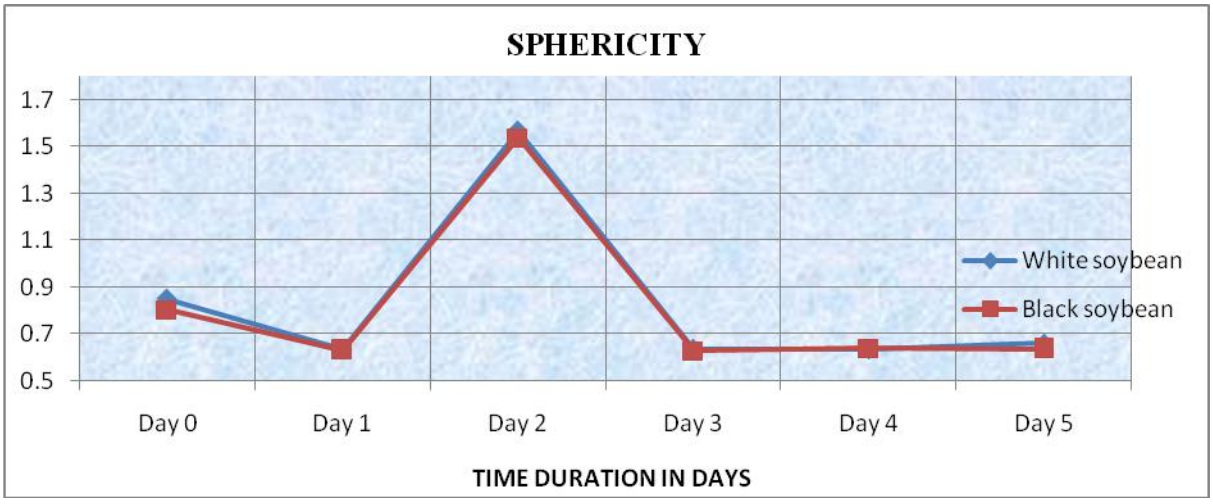

Figure 8: Showing the Sphericity vs. time duration in days (Black and white soybean)

Table 1: Principle dimension, difference in weight, moisture content, total solid content, geometric mean and sphericity of black and white soybean.

	DAY0		DAY 1		DAY 2		DAY 3		DAY 4		DAY 5	
	BS	**WS**	**BS**	**WS**	**BS**	**WS**	**BS**	**WS**	**BS**	**WS**	**BS**	**WS**
LENGTH(MM)	6.51 ± 0.526	6.470± 0.181	10.66± 0.622	10.898 ± 0.361	10.948 ± 0.707	11.083 ± 0.372	11.06 ± 0.685	11.14 ± 0.385	11.087 ± 0.756	11.28 ± 0.389	11.59± 0620	11.45± 0.369
MAXIMIUM(mm)	7.3	6.75	11.47	11.5	11.87	11.66	12.35	11.85	12.8	12.01	13.35	12.9
MINIMUM	5.5	6.1	9.9	10	9.9	10.35	10	10.5	9.9	10.5	9.85	10.5
WIDTH (MM)	5.28 ± 0.26	5.724± 0.293	6.56 ± 0.227	6.74± 0.314	6.67 ± 0.383	6.94 ± 0.467	6.672 ± 0.632	7.13 ± 0.339	6.719 ± 0.3426	7.13 ± 0.447	7.07± 0.223	7.29± 0.327
MAXIMUM	5.85	6.92	6.78	7.3	7.2	7.55	7.35	7.7	8	7.85	8.15	7.87
MINIMUM	4.9	5	5.1	6.05	5.85	6.35	5.85	6.4	6	6.7	6.35	6.7
THICKNESS(mm)	4.16 ± 0.28	4.466± 0.304	4.365 ±0.268	4.466± 0.262	4.488 ± 0.362	4.473 ± 0.27	4.56 ± 0.381	4.478 ± 0.177	4.57 ± 0.3265	4.553 ± 0.259	4.891± 0.110	5.16± 0.264
MAXIMUM	4.56	4.77	4.7	4.77	4.91	4.8	4.95	4.95	5.11	5.25	5.85	5.65
MINIMUM	3.25	4	3.58	4	3.6	4	3.95	4.01	4.1	4.05	4.2	4.35
Before weight	1.789	2.186	3.936	4.195	3.634	4.48	4.151	4.57	4.523	5.124	4.441	5.466
after weight	1.716	2.119	1.85	2.383	1.522	1.857	1.886	1.744	2.016	2.201	1.87	2.376
difference in weight	0.073	0.067	2.086	1.812	2.112	2.623	2.265	2.826	2.507	2.923	2.571	3.09
moisture content in %	4.08	3.06	52.99	43.19	58.11	58.54	54.56	61.83	55.42	57.04	57.89	56.31
solid content in %	95.91	96.93	47	59.8	41.88	41.45	45.43	38.16	44.57	42.95	42.1	43.46
geometric mean	5.22	6.78	6.73	6.89	6.89	7	6.95	7.08	6.98	7.14	7.37	7.55
spherecity	0.803	0.848	0.631	0.632	1.536	1.566	0.6288	0.636	0.638	0.634	0.636	0.659

WS : White Soybean BS : Black Soybean

CONCLUSIONS

The investigation on various physical properties of black and white soybeans revealed the following results from **day 0 to day 5.**

(1). The average length, width and thickness of black soybean grains ranged from 6.51 to 11.59 mm, 5.28 to 7.07 mm, and 4.16 to 4.89 mm respectively.

(2). The average length, width and thickness of white soybean grains ranged from 6.47 to 11.45 mm, 5.724 to 7.29 mm, and 4.466 to 5.16 mm respectively.

(3). The geometric mean diameter increased in black soybean grain from 5.22 to 7.37 mm.

(4). The geometric mean diameter of white soybean grain increased from 6.78 to 7.55 mm.

(5).The moisture content increased from 4.08 to 57.89 % and 3.06 to 56.31 % of black and white soybean respectively. Patel, K.D (2014) reported that the moisture content of soybean samples were in the range of (6.1±0.5) % to (6.3±0.5) %.

(6).The total solids content decreased from 95.91 to 42.1 % and 96.93 to 43.46% of black and white soybean grains respectively.

REFERENCES

1. **AOAC, (1990).** Official Methods of Analysis. 15th Edn., AOAC, Washington, DC., USA, 200-210.
2. **CGC (2004).** Official grain grading guide. Canadian Grain Commission, Winnipeg, Manitoba, Canada (http://www.grainscanada.gc.ca/Pubs/GGG/ggg-e.htm)
3. **Kulkarni, S.D., (1994)**. Roasted soybean in cookies: Influence on product quality. J. Food Sci. Technol., 34: 503-505.
4. **Pandya, A.P. and Patel, K.D., (2014).**Analysis of Biochemical composition of hulled and dehulled white soybean. Life Science Leaflets, 51:109-114.
5. **Patel, K.D. and Pandya, A.P., (2014)**. Assessment and comparison of physical parameters of black and white soybean. Life Science Leaflets, 49:119-125.
6. **Perry DA., (1980).** Seed vigour and seedling establishment. Advances in Research and Technology of Seeds, 5: 25-40.
7. **Pordesimo, L. O.,** R. C. Anantheswaran, A. M. Fleischmann, Y. E. Lin, and M. A. Hanna. **(1990).** Physical properties as indicators of popping characteristics of microwave popcorn. *Journal of Food Sciences*, 55 (5): 1352-1355.
8. **Roshanak Rezapour1*, Hamdollah Kazemi-arbat[1], Mehrdad Yarnia1 and Parisa Zafarani- Moattar[2,](2013).** Effect of seed size on germination and seed vigor of two

soybean(glycin max L.) cultivars. International Research Journal of Applied and Basic Sciences. 4 (11): 3396-3401.

9. **Sahoo, P. and Srivastava, A.P., (2002).** Physical properties of Okra seed. Biosyste Engineering, 83(4), 441-448.
10. **Sakai, N. and S.Yonekawa, (1991).** Three-Dimensional Image Analysis of the Shape of Soybean Seed. Joul Food Eng, 15:221-234.
11. **Salas. P, J.C**. **Oyarzo-Llaipen, D. Wang, K. Chase and L. Mansur** (**2006).** Genetic mapping of seed shape in three populations of recombinant inbred lines of soybean (*Glycine max* L.Merr.) Theor Appl Genet, 113:1459-1466.
12. **Wilson, L.A. (1995).** Soy foods.p. 428-459. *In* D.R. Erickson (ed.) Practical handbook of soybean processing and utilization. AOCS Press & United Soybean Board, St. Louis, MO.