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# A Comparative Analysis of Big and Small Seeded Varieties of Castor Seed (Ricinus Communis) and its Oil

Ayodeji Samuel Omotehinse
[1]Department of Mechanical Engineering
Benson Idahosa University
Benin City Nigeria
somotehinse@biu.edu.ng

Tunde Basit Adeleke
[1]Department of Mechanical Engineering
Benson Idahosa University Benin City
Nigeria
tundebasit123@gmail.com

Sunday Adeniran Afolalu[2,3]
. [2]Department of Mechanical and mechatronics Engineering
Afe Babalola University
Ado-Ekiti Nigeria
[3]Department of Mechanical and Engineering Science
University of Johannesburg,
Johannesburg, South Africa
adeniran.afolalu@abuad.edu.ng

Stella Isioma Monye[2]
[2]Department of Mechanical and Mechatronics Engineering
Afe Babalola University
Ado-Ekiti Nigeria
monyeis@abuad.edu.ng

Imhade Princess Okokpujie[2,4]
[2]Department of Mechanical and Mechatronics Engineering
Afe Babalola University
Ado-Ekiti, 360001, Nigeria
[4]Department of Mechanical and Industrial Engineering Technology
University of Johannesburg

Johannesburg, 2028 South Africa
ip.okokpujie@abuad.edu.ng

Kazeem Bello Aderemi
Department of Mechanical Engineering,
Federal University of Oye Ekiti.
Ekiti State, Nigeria
kazeem.bello@fuoye.edu.ng

Cordelia Ochuole Omoyi
[5]Department of Mechanical Engineering
University of Calabar,
Cross River Nigeria
cordeliaochuole@unical.edu.ng

Samuel Obinna Nwankwo
[2]Department of Mechanical and mechatronics Engineering
Afe Babalola University
Ado-Ekiti Nigeria
nwankwoso@abuad.edu.ng

Snow Ngozi Monye
[6]Department of Information Communication Technology
University of Delta
Agbor Nigeria
ngozi.monye@unidel.edu.ng

***Abstract*— The percentage yield of castor seed oil in green energy is an emerging area of interest in the quest for sustainable and renewable energy sources. The Castor seed and its oil which has been regarded as being particularly beneficial for both domestic and industrial applications is totally distinct within the Euphorbiaceae spurge family. This castor seed comes in a variety of shapes and sizes. Scholars have differing opinions on the amount of oil that may be produced from castor seed and their relative growth traits. he plants' varying development traits. In addition to establishing the relationship between the big and small castor seeds in terms of their development potential and oil extraction yield, this study is intended to close the gaping hole. The daily growth parameters were collected over a period of 146 days. The soxhlet extraction technique employed yielded thirteen (13) oil extraction data for both the big and small castor seeds. Using the paired sample t-test, response surface approach, and SPSS version 16, the obtained data were descriptively analyzed. According to descriptive statistics, the mean, standard deviation, and standard error mean of the pooled sample of both the big and small castor oil extraction yield were 51.02, 3.67, and 0.72, respectively. Big castor seed yield had a minimum value of 42.45%, a maximum value of 54.80%, a mean value of 51.69, and a standard deviation of 3.66. The minimum yield for small castor seed was found to be 41.36%, with a maximum value of 53.90%, a mean value of 50.35, and a standard deviation of 3.69. Our findings demonstrate that, at a reaction temperature of 94.14 ºC and a reaction time of 520.92 minutes (8.68 hours), the optimal oil extraction yield of 55.76% from big castor seeds is much greater than the yield of 54.02% from small castor seeds. However, it is clear from our experimental result that the big castor seed shrubs exhibit growth traits and oil yields that are substantially greater than those of small castor seed shrubs.**

**Keywords— Castor seed, Growth response, Oil extraction, Big seed, Small seed**

## I. INTRODUCTION

The business environment is changing as a result of the relative growth in castor seed oil interest over the past few years. Foreign and local investors are faced with the challenge of figuring out how to unlock the industrial and domestic potentials buried in castor seed and its oil as they both see opportunities. Due to the oil's desirable properties, which include being a good constituent for surface coatings, polymers, lubricants for aircraft, cosmetics, food seasoning, perfumery products, ointments, waxes, pharmaceuticals, printing inks, hair dressings, nylon, enamels, electrical insulations, and disinfectants, there is an increase in interest in the castor seed plant and its oil. The percentage yield of castor seed oil in green energy is an emerging area of interest in the quest for sustainable and renewable energy sources. Castor oil, derived from the seeds of the castor bean plant (*Ricinus communis*), has gained attention as a potential feedstock for biodiesel production. The higher the percentage yield of oil from castor seeds, the more oil can be extracted and converted into biodiesel. This biodiesel can be used to replace or supplement traditional fossil fuels in various applications, such as transportation and power generation, reducing greenhouse gas emissions and promoting green energy. Biodiesel from castor oil is considered a cleaner alternative to traditional diesel, and a higher yield can have a more substantial positive impact on reducing carbon emissions. Although significant progress has already been made on the crop in Nigeria, much more research is still needed to fully understand its agronomic needs as they relate to its morphological traits, growth patterns, and oil yield. Reviewing previous and current research efforts is thus crucial given the area of research. The castor bean has one of the highest viscosities among vegetable oils, with a molecular weight of 298. [1] stated that castor bean has 35-55% oil weight for high production breed varieties. Castor oil plant was described as a fast-growing, suckering, perennial shrub that frequently grows to the size of a small tree by Rial et al. [2] and Conceicao et al. [3]. According to [4], it typically grows from 1.8 to 5 meters (6-15 feet) tall in a single season. Castor seed and its derivatives, according to studies by Gana et al. [5] and Bello and Makanju [6], can be treated to create a variety of secondary and advanced materials that are useful across a wide range of sectors. They clarified that up to 40% protein and roughly 30% oil are both present in castor seed. The majority of castor oil's uses, according to [7] and [8], are in cooking, where it is used as a spice. Bello and Makanju [6] as a potential replacement fuel for diesel engines investigated castor oil methyl ester. Castor oil was used as the feedstock for a continuous biodiesel factory constructed by [9] that was simulated in the HYSYS simulator. Conceicao et al. [3] gave a thermo-analytical and physical-chemistry characterization of castor oil and biodiesel. Using an alkali catalyst, the devised process was able to produce biodiesel with a high degree of purity. Castor seed growth rates were also measured by Severino and Auld [10], who also established the basal temperature for this vital physiological process. It was determined that when the air got colder, the pace of seed growth slowed down. When racemes were first started on July 31 at an average temperature of 28 °C, the seed growth rate was 13.8 mg day-1 as opposed to 4.3 mg day-1 for racemes started on August 20 at an average temperature of 20 °C. According to estimates, the base temperature for castor seed growth is $15^0$C, and it takes 464 degree-days for a castor seed to attain physiological maturity. Castor seeds from four major cities in Nigeria, including Akure, Ibadan, Bida, and Ogbomoso, were sampled and examined by Akande et al. [11] for their physical and chemical characteristics during the dry season. Small seeded variety (SSV) and large seeded variety (LSV) seeds were used to classify the seeds. SSV produced an oil yield of 39.4%, which was higher than the oil yield of 37.2% achieved from LSV when pressed mechanically using a hydraulic machine. Castor seed oil was optimized and characterized by Shridhar et al. [12] using the solvent extraction method. The percentage of oil extracted, according to the result, was 48.75%. Castor seed oil was also extracted and described by Abitogun et al. [13] using the solvent extraction method. The analysis revealed that 48% of the oil was removed. Olaniyan [14] looked at how castor seed oil yield and quality were affected by the conditions of the extraction. The outcome revealed a maximum oil yield of 41.67% (75.76 oil recovery) employing crushed seed during pressing for 12 minutes at $90^0$C heating temperature and 135Kpa pressure. The percentage recovery of oil from castor seed was examined by Shridhar et al. [12] with respect to dilution level and agitation time. The maximal extraction was determined to be 48.75%, while the optimal dilution level and agitation duration were found to be 7.3 and 2.38 hours, respectively. The aforementioned earlier research projects looked at the yield of castor seed oil as well as its use in a variety of industrial and domestic applications, but they haven't yet examined its growth pattern or conducted a comparative analysis of the yield capacity in various castor seed varieties, which is what this study aims to do. The purpose of this study is to compare the growth responses and percentage oil extraction yields of the big and small seeded varieties of castor seed in order to aid potential investors in backward integration.

## II. Materials and Methods

### A. Materials

The Castor seeds used are the big-seeded varieties (BSV) and the small-seeded varieties (SSV) purchased from a farmland in Ikokogbe, Omhen in Ewossa Community, Igueben Local Government Area of Edo State, Nigeria. The Models chosen were carefully selected for this work based on their reliabilities. For the extraction process, all chemicals and reagents used were analytical grade from Sigma Aldrich and were used without any further purification. Distilled water was used for the preparation of reagents. Laboratory apparatuses were washed with detergent, rinsed with distilled water and oven-dry before use.

### B. Methods

The first data used was obtained by measuring the daily growth response of castor seed shrub such as plant height, stem diameter, leaf width, leaf length, petiole length and the petiole diameter for the two varieties of castor seed. Each growth characters was measured two (2) times and the average taken. The data span from the day the castor shrub sprouted up till maturity which is 146days. The experiment was laid out in a completely randomized design replicated two times. Germination was observed at the emergence of the cotyledons above the soil surface. The second set of data was obtained from the percentage oil extraction yield using soxhlet extraction method. The resulting data were descriptively analyzed using SPSS version 16, paired sample t-test and response surface methodology.

## III. Results and Discussion

The abridged daily growth characteristics of the castor seeds are presented in Table 1. The paired sample t-test employed to compare the variables between the big castor seed and the small castor seed are shown in Tables 2 and 3. It is evident from the results of measurements shown in Table 1 that the response rate of growth characters such as plant height, stem diameter, leaf width, leaf length, petiole length and petiole diameter at maturity are significantly higher in big castor seed shrub than in small castor seed shrub. Table 2 illustrate the paired sample statistics for the daily growth response in big and small castor seed shrub.

Tables 2 depict the descriptive statistics of big castor seed and small castor seed for 146 days. The mean of 75.57 and standard deviation of 48.42 was observed in big seed plant height while mean of 85.47 and standard deviation of 42.77 was observed in small seed plant height. The Table also showed the mean of 7.74 and 5.93 in stem diameter for big and small seed with a standard deviation of 0.29 and 0.24 respectively. The mean of big castor seed leaf width of 15.98 was higher than that of the small seed gotten as 12.95. Same was also observed in big seed leaf length $36.67 \pm 17.16$ and small seed leaf length $30.43 \pm 15.62$, big seed petiole length $37.89 \pm 19.34$ and small seed petiole length $31.52 \pm 17.56$ as well as big seed petiole diameter $5.12 \pm 2.87$ and small seed petiole diameter $4.28 \pm 2.45$. Table 3 depict the paired samples test for the daily growth response showing the lower and the upper critical level as well as the t-value.

### A. Statement of Hypothesis for Daily Growth Character

$H_0$: There are no significant differences between the big castor seed and small castor seed.

$H_1$: There are significant differences between the big castor seed and small castor seed.

### B. Decision Criteria:

If t-value falls within the lower and upper critical value, accept $H_0$

If t-value falls outside the lower and upper critical value, reject $H_0$

### C. Interpretation of Results for the Growth Character

**Plant Height:** Since t-value obtained is 14.258 and falls outside the lower critical value of 11.279 and upper critical value of 8.533, we therefore reject the null hypothesis and conclude that there are significant differences between the height of big castor seed shrub and small castor seed shrub.

**Table 1.** Abridged Daily Growth Response for Big and Small Castor Seed

| S/N | PHBS | PHSS | SDBS | SDSS | LWBS | LWSS | LLBS | LLSS | PLBS | PLSS | PDBS | PDSS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 3 | 4.15 | 5.50 | 1.40 | 0.55 | 1.90 | 2.15 | 2.80 | 2.70 | 0.65 | 1.35 | 0.55 | 0.45 |
| 4 | 4.50 | 6.60 | 1.70 | 0.60 | 2.25 | 2.30 | 3.20 | 2.95 | 0.85 | 1.60 | 0.75 | 0.45 |
| 5 | 4.75 | 7.35 | 1.90 | 0.70 | 2.60 | 2.45 | 3.60 | 3.25 | 1.30 | 1.80 | 0.85 | 0.55 |
| 6 | 5.10 | 8.70 | 2.15 | 0.75 | 2.90 | 2.75 | 4.10 | 3.45 | 1.55 | 1.95 | 0.95 | 0.65 |
| 7 | 5.90 | 10.15 | 2.35 | 0.85 | 3.50 | 3.05 | 4.45 | 3.65 | 1.95 | 2.25 | 1.00 | 0.65 |
| 8 | 7.30 | 13.45 | 2.55 | 0.90 | 1.90 | 0.90 | 3.15 | 2.35 | 0.30 | 0.35 | 0.15 | 0.25 |
| 9 | 8.50 | 15.55 | 2.60 | 1.00 | 2.35 | 1.25 | 3.65 | 2.65 | 0.85 | 0.80 | 0.35 | 0.45 |
| 10 | 9.60 | 17.65 | 2.65 | 1.10 | 2.75 | 1.65 | 4.15 | 3.05 | 1.70 | 1.40 | 0.45 | 0.70 |
| 11 | 12.10 | 19.20 | 2.75 | 1.25 | 3.35 | 2.05 | 4.70 | 3.45 | 2.45 | 1.90 | 0.60 | 0.85 |
| 12 | 12.85 | 20.40 | 2.85 | 1.40 | 3.65 | 2.40 | 5.40 | 4.15 | 3.20 | 2.15 | 0.70 | 0.95 |
| 13 | 13.65 | 23.95 | 2.95 | 1.50 | 4.10 | 2.75 | 6.80 | 4.65 | 3.90 | 2.70 | 0.80 | 1.05 |
| 14 | 14.75 | 26.15 | 3.05 | 1.65 | 4.35 | 3.25 | 7.50 | 5.65 | 4.55 | 3.35 | 0.90 | 1.10 |
| 15 | 15.80 | 27.55 | 3.20 | 1.65 | 4.60 | 3.45 | 8.40 | 5.95 | 5.85 | 3.95 | 1.00 | 1.20 |
| 16 | 16.55 | 31.10 | 3.20 | 1.75 | 4.75 | 3.65 | 9.65 | 6.35 | 6.80 | 4.20 | 1.15 | 1.20 |
| 17 | 16.95 | 32.70 | 3.30 | 1.85 | 4.90 | 3.90 | 10.50 | 6.65 | 7.25 | 5.10 | 1.30 | 1.30 |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| 144 | 159.80 | 155.60 | 13.25 | 10.65 | 29.90 | 28.10 | 60.65 | 56.35 | 62.90 | 55.95 | 9.25 | 8.65 |
| 145 | 160.95 | 156.60 | 13.35 | 10.75 | 30.25 | 28.45 | 61.00 | 57.35 | 63.10 | 56.55 | 9.35 | 8.75 |
| 146 | 161.65 | 159.10 | 13.50 | 10.85 | 30.50 | 29.10 | 61.45 | 57.80 | 63.30 | 56.95 | 9.35 | 8.85 |

**Table 2.** Paired samples statistics for the daily Growth Response

**Paired Samples Statistics**

| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Big Seed Plant Height | 75.5678 | 146 | 48.42027 | 4.00729 |
| | Small Seed Plant Height | 85.4740 | 146 | 42.76869 | 3.53956 |
| Pair 2 | Big Seed Stem Diameter | 7.7432 | 146 | 3.47192 | .28734 |
| | Small Seed Stem Diameter | 5.9284 | 146 | 2.95821 | .24482 |
| Pair 3 | Big Seed Leaf Width | 15.9829 | 146 | 9.52774 | .78852 |
| | Small Seed Leaf Width | 12.9517 | 146 | 6.91043 | .57191 |
| Pair 4 | Big Seed Leaf Length | 36.6723 | 146 | 17.16256 | 1.42038 |
| | Small Seed Leaf Length | 30.4288 | 146 | 15.62000 | 1.29272 |
| Pair 5 | Big Seed Petiole Length | 37.8983 | 146 | 19.34414 | 1.60093 |
| | Small Seed Petiole Length | 31.5168 | 146 | 17.56440 | 1.45364 |
| Pair 6 | Big Seed Petiole Diameter | 5.1158 | [illegible] | [illegible] | .23798 |
| | Small Seed Petiole Diameter | 4.2805 | [illegible] | [illegible] | [illegible] |

**Table 3.** Paired samples test for the d

**Paired Samples Test**

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference Lower | Upper | | | |
| Pair 1 | Big Seed Plant Height - Small Seed Plant Height | -9.90616 | 8.39520 | .69479 | -11.27939 | -8.53294 | -14.258 | 145 | .000 |
| Pair 2 | Big Seed Stem Diameter - Small Seed Stem Diameter | 1.81473 | .58037 | .04803 | 1.71979 | 1.90966 | 37.782 | 145 | .000 |
| Pair 3 | Big Seed Leaf Width - Small Seed Leaf Width | 3.03116 | 4.89752 | .40532 | 2.23006 | 3.83227 | 7.478 | 145 | .000 |
| Pair 4 | Big Seed Leaf Length - Small Seed Leaf Length | 6.24349 | 2.12112 | .17555 | 5.89654 | 6.59045 | 35.566 | 145 | .000 |
| Pair 5 | Big Seed Petiole Length - Small Seed Petiole Length | 6.38151 | 2.70860 | .22417 | 5.93845 | 6.82456 | 28.468 | 145 | .000 |
| Pair 6 | Big Seed Petiole Diameter - Small Seed Petiole Diameter | .83534 | .57200 | .04734 | .74178 | .92891 | 17.646 | 145 | .000 |

**Stem diameter:** Since t-value obtained here is 37.782 which is above the lower critical value of 1.730 and upper critical value of 1.910, we thus reject the null hypothesis and say that there are significant differences between the stem diameter of big castor seed shrub and small castor seed shrub.

**Leaf Width:** Since the t-value obtained is 7.478 which fall outside the lower critical value of 2.230 and the upper critical value of 3.832, we therefore reject the null hypothesis and accept the alternate hypothesis that there are significant differences between the leaf width of big castor seed shrub and small castor seed shrub.

**Leaf Length:** Since the t-value obtained for the leaf length is 35.566 and this falls outside the two critical values of 5.896 and 6.590, we therefore reject the null hypothesis and conclude that there are significant differences between the leaf length of big castor seed shrub and small castor seed shrub.

**Petiole Length:** The t-value of 28.468 is obtained for petiole length and this is outside both the lower and the upper critical value of 5.938 and 6.824. With this, we do not have sufficient evidence for us to accept the null hypothesis and hence infer that there are significant differences between the petiole length of big castor seed shrub and small castor seed shrub.

**Petiole Diameter:** Since the t-value obtained is 17.646 which lie outside the lower critical value of 0.742 and the upper critical value of 0.929, we reject the null hypothesis and accept the alternate hypothesis and then conclude that there are significant differences between the petiole diameter of big castor seed shrub and small castor seed shrub.

### *D. T-test result for the percentage oil extraction yield*

Table 4 depict the observed and predicted values obtained for the percentage oil extraction yield for both the big castor seed and the small castor seed. Table 5 display the descriptive statistics while the pooled sample statistics is shown in Table 6.

**Table 4.** Observed and Predicted Values of Big and Small Castor Percentage oil Extraction Yield

| Run | Coded values | Actual values | $\text{Yield}_{\text{Big seed}}$ (%) | $\text{Yield}_{\text{Small seed}}$ (%) |
|---|---|---|---|---|

| | $X_1$ | $X_2$ | Reaction time (mins) | Reaction temperature (℃) | Observed values | Predicted values | Observed values | Predicted values |
|---|---|---|---|---|---|---|---|---|
| 1 | -1.000 | 1.000 | 139.08 | 94.14 | 45.55 | 45.51 | 44.14 | 44.29 |
| 2 | -1.414 | 0.000 | 60.00 | 80.00 | 42.45 | 43.47 | 41.36 | 42.43 |
| 3 | 0.000 | 0.000 | 330.00 | 80.00 | 52.60 | 52.60 | 50.80 | 50.82 |
| 4 | 1.000 | -1.000 | 520.92 | 65.86 | 54.80 | 54.22 | 53.90 | 52.98 |
| 5 | 0.000 | 1.414 | 330.00 | 100.00 | 53.40 | 52.62 | 52.60 | 51.54 |
| 6 | 0.000 | 0.000 | 330.00 | 80.00 | 52.60 | 52.60 | 50.83 | 50.82 |
| 7 | 1.000 | 1.000 | 520.92 | 94.14 | 54.80 | 55.76 | 53.90 | 55.02 |
| 8 | 1.414 | 0.000 | 600.00 | 80.00 | 54.80 | 54.40 | 53.90 | 53.60 |
| 9 | -1.000 | -1.000 | 139.08 | 65.86 | 50.60 | 49.01 | 49.81 | 47.92 |
| 10 | 0.000 | -1.414 | 330.00 | 60.00 | 52.60 | 54.01 | 50.83 | 52.66 |
| 11 | 0.000 | 0.000 | 330.00 | 80.00 | 52.60 | 52.60 | 50.83 | 50.82 |
| 12 | 0.000 | 0.000 | 330.00 | 80.00 | 52.60 | 52.60 | 50.83 | 50.82 |
| 13 | 0.000 | 0.000 | 330.00 | 80.00 | 52.60 | 52.60 | 50.83 | 50.82 |

**Table 5.** Descriptive Statistics of Big and Small Castor Percentage oil Extraction Yield

**Descriptive Statistics**

| | N | Mean | Std. Deviation | Minimum | Maximum | Percentiles | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 25th | 50th (Median) | 75th |
| Big Castor Seed | 13 | 51.6923 | 3.66486 | 42.45 | 54.80 | 51.6000 | 52.6000 | 54.1000 |
| Small Castor Seed | 13 | 50.3508 | 3.69572 | 41.36 | 53.90 | 50.3050 | 50.8300 | 53.2500 |

**Table 6.** Paired Samples Test for Big and Small Castor Percentage oil Extraction Yield

**Paired Samples Test**

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| Big Castor Seed - Small Castor Seed | 1.34154 | .44519 | .12347 | 1.07251 | 1.61057 | 10.865 | 12 | .000 |

The minimum value of big castor seed oil yield gotten after extraction was 42.45% for observed and 43.47% for predicted, with a maximum oil yield value of 54.80% for observed and 55.76% for predicted. For small castor seed, the minimum oil extraction yield was observed at 41.36% for observed and 42.43% for predicted, with a maximum oil extraction yield of 53.90% for observed and 53.60% for predicted as evident in Table 4. A mean value of 51.69 and standard deviation of 3.66 was achieved for big castor seed oil yield while a mean value of 50.35 and standard deviation of 3.69 was achieved for small castor seed oil yield as seen in Table 5.

**Statement of Hypothesis for Percentage Oil Extraction yield**

$H_0$: There are no significant differences between the big castor seed and small castor seed yield.

$H_1$: There are significant differences between the big castor seed and small castor seed yield.

***Decision* Criteria**: If t-value falls within the lower and upper critical value, accept $H_0$

If t-value falls outside the lower and upper critical value, reject $H_0$

The result of castor seed oil extraction yield paired samples test presented in Table 6 showed t-value of 10.865, lower critical value of 1.072 and upper critical value of 1.610. Since the t-value obtained falls outside the lower critical value and the upper critical value, we reject the null hypothesis $H_0$ and accept the alternate hypothesis $H_1$, and therefore conclude that there are significant differences between the big castor seed and small castor seed percentage oil extraction yield.

### *E. Big Castor Seed Oil Extraction Yield Optimization*

The isoresponse contour plots and the surface response plots for big castor seed oil yield is shown in Figure 1 and 2. From the plots, it was observed that oil yield increases as the levels of both reaction time and reaction temperature are raised. Looking at the surface response plot, the optimization point to get the maximum oil yield performance of 55.76% was observed at a reaction time of 520.92mins (8.68hr) and a reaction temperature of 94.14℃.

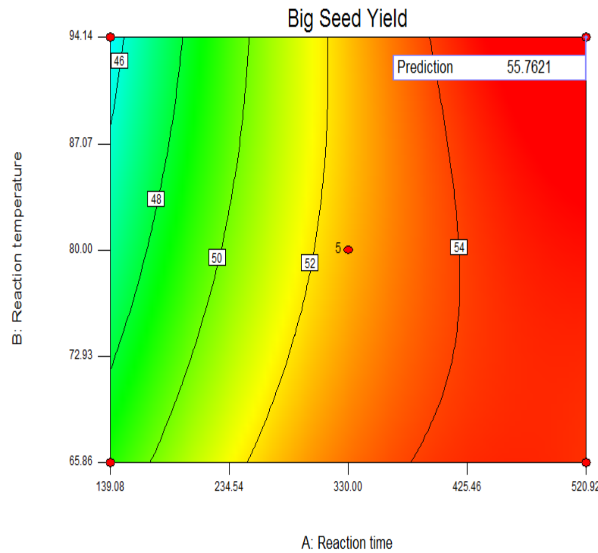


Fig. 1. Isoresponse contour plots of big castor seed oil after extraction

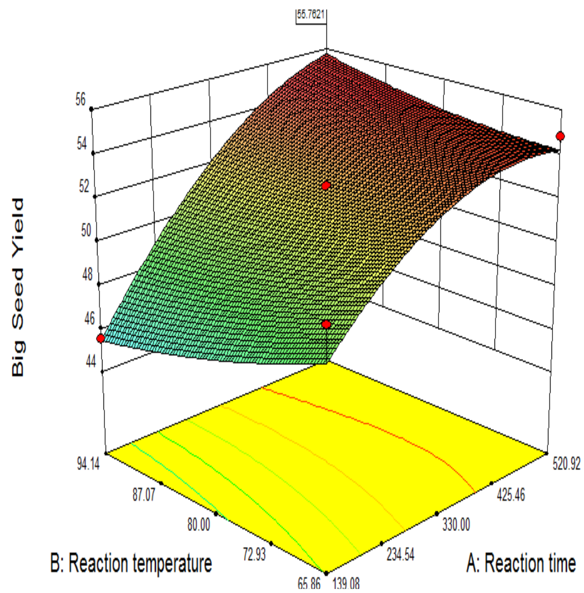


Fig. 2. Response surface plots of big castor seed oil after extraction

The ramp solution that graphically represent the optimal yield of big castor seed of 55.76% observed at a reaction time of 520.92mins (8.68hr) and a reaction temperature of 94.14℃ with a desirability value of 0.938 (94%) is shown in Figure 3.


Fig. 3. The ramp solution of numerical optimization for big castor seed yield

### F. *Small Castor Seed Oil Extraction Yield Optimization*

The response surface curves were plotted to understand the interaction of the variables and to determine the optimum level of each variable for maximum response. The contour plots of small seed oil extraction is shown in Figure 4 while the response surface plot showing the interactive effect of reaction time and reaction temperature is shown in Figure 5.

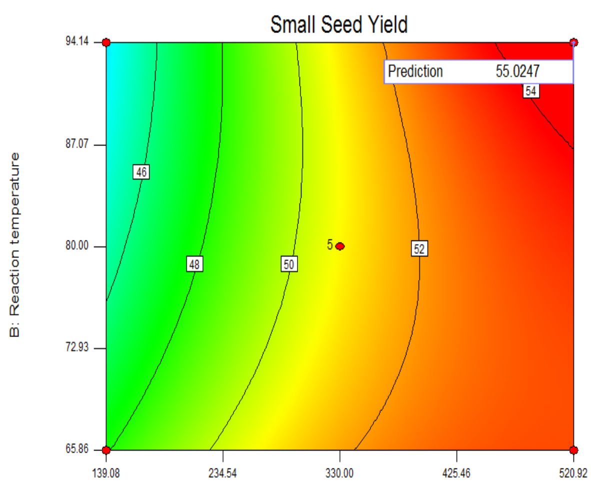


Fig. 4. Isoresponse contour plots of small castor seed oil after extraction

It was observed that a reaction time of 520.92 mins and reaction temperature of 94.14°C produced an optimum oil yield of small castor seed of 55.02%. This value was selected by design expert as the optimal solution with a desirability value of 96.7%.

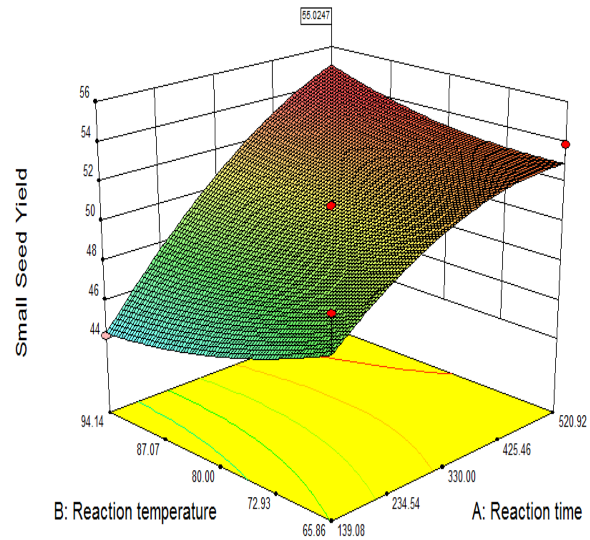


Fig. 5. Response Surface plots of small castor seed oil after extraction

It was observed that a reaction time of 520.92 mins and reaction temperature of 94.14°C produced an optimum oil yield of small castor seed of 55.02%. This value was selected by design expert as the optimal solution with a desirability value of 96.7%.

## IV. CONCLUSION

This study has demonstrated that castor seed shrub has the capacity to grow to maturity in about 146 days which falls favourably within the growth period specified by [15, 16, 17] who noted that the approximate growing season of castor plant is between 140 and 180 days. It is evident from our analysis that growth characteristics is significantly higher in big castor seed shrub than in small castor seed shrub. Our results showed a large variability of plant parameters in plant height, stem diameter, leaf width, leaf length, petiole length and petiole diameter between the big castor seed and the small castor seed. The study has also shown that the percentage oil extraction yield of castor depends on the variety of the seeds. The quick growth and development that is apparent in the castor shrub make the seeds a dependable veritable resource. This has far-reaching implications for using the seed to obtain oil for the manufacturing of slate of products.

***Abbreviations and Acronyms***

PHBS – Plant Height Big Seed

PHSS - Plant Height Small Seed

SDBS - Stem Diameter Big Seed

SDSS – Stem Diameter Small Seed

LWBS – Leaf Width Big Seed

LSSS - Leaf Width Small Seed

LLBS – Leaf Length Big Seed

LLSS - Leaf Length Small Seed

PLBS – Petiole Length Big Seed

PLSS - Petiole Length Small Seed

PDBS - Petiole Diameter Big Seed

PDSS - Petiole Diameter Small Seed

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