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THE EFFECT OF HEATING TEMPERATURE ON SEVERAL VARIETIES ON THE PRODUCTION AND QUALITY OF SESAME OIL

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ABSTRACT

Increasing agricultural products to be competitive by increasing value added is very important. The study aimed to find out the best treatment from a combination of the effect of heating temperature and sesame varieties on the production and quality of sesame oil. This study used factorial completely randomized design method where the first factor was sesame variety (Sbr1, Sbr2, Sbr3, Sbr4, and Winnas1) and the second factor was heating temperature with levels 90°C, 100°C, and 110°C. The variables observed were the weight of pulp, total oil production, oil color, and fatty acid content. The results showed that the Sbr4 variety with a temperature of 110°C had the highest oil production even though it was not significantly different from Winnas1, as well as its aroma and fatty acid content.

INTRODUCTION

Agroindustry is a way to increase the strengthness of agricultural sector. The important factor to develop agroindustry is increasing some products using technology (Budi, 2014). Agroindustry transform raw material from land and intermediate or by product to finished good. Sesame is prospective agriculture commodity that can increasing their competitiveness by producing good quality sesame oil. Producing good quality of sesame oil needs to controlled the process. Errors in producing process will decrease the quality of sesame oil. Some influential factors are the quality of raw material and processing technology (Budi, 2005). The important factor to produce good quality of sesame oil is the variety of sesame.

There are many varieties of sesame, namely (Sbr1, Sbr2, Sbr3, Sbr4, Winnas1, and Winnas2) and several local varieties. The differences of raw matterial will produce the different quality and quantity of sesame oil because of the genetic factor and the different environment of sesame (Budi, Puspitawati, & Nurwantara, 2019, (Budi, Ma'arif, Saillah, & Raharja, 2009). The steps of producing sesame oil are sortation, roasting, blanching, and saponification. The important factor in sesame oil producing is the effect of temperature in production process when roasting and blanching. Dalimunthe, dkk (2015) saids that temperature will effect on the rendemen of patchouli oil. It happens to in palm oil, the temperature totaly give effect in dozing and extraction process (Dalimunthe, Harahap, & Munir, 2015).

The aim of this research is to know the effect of temperature on several varieties of sesame in producing sesame oil. The right temperature will determine the quality and quantity the sesame oil. Sesame oil consist free fatty acid which are very beneficial for human health. The function of free fatty acid especially oleic acid (C18:1) and linoleic acid (C18 :2, Omega-6) are as vegetable oil, seasoning, or salad oil (Handayani, Manuhara, & Anandito, 2010), (Ketaren, 1986).

MATERIAL AND METHODS

Place and Time

This research done in agriculture faculty laboratory of Merdeka Madiun University on April 2019 – June 2019.
Material and Equipment

This research using five variants of sesame, that are Summberrejo1 (Sbr1), Sumberrejo2 (Sbr2), Sumberrejo3 (Sbr3), Sumberrejo4 (Sbr4), and Winnas1. The other material are alluminium foil, zeolit, filter paper, plastic bag, plastic bottle, adhesive tape, and monyl cloth. This research using instruments or equipments for roasting, grinding, hidrolic press, centrifuge, buckets, filters, ,scales, oven, measuring cups, measuring flasks, and funnels. The research method is using randomized block design factorial. The first factor is temperature, the second factor is the variety of sesame, the other factor is dose of zeolit. The temperature using three different level which is 90^{o}C (S90C), 100 ^{o}C (S100C), and 110 ^{o}C (S110C). The variety of sesame that using in this research is Summberejo1 (Sbr1), Sumberrejo 2 (Sbr2), Sumberrejo 3 (Sbr3), Sumberrejo4 (Sbr4), and Winnas1. The dose of zeolit contains three levels, i. e. 15% (Z15), 20% (Z20) DAN 25% (Z25).

The observation parameter is pulp weight, the volume of oil, the oil content, aroma, taste, and color: (ini berasa ada kalimat yang kurang aku gatau apa, tolong tanyakan ayah ya)

1. The pulp weight is the amount of oilcake produced from the pressing process.
2. The volume of oil is the amount of oil produced from pressing process calculated by measuring the volume of oil produced using a measuring flask.
3. The content of oil is the percentage of oil content in the seeds that calculated from the volume of oil divided the weight of seeds, then multiplied by 100 percent.
4. The oil aroma is the aroma of oil that test by organoleptic test and the score is 5 (very fragrant), 4 (fragratnt), 3 (pretty fragrant), 2 (less fragrant), and 1 (not fragrant).
5. The oil flavor is the taste that measured using flavor grading card and then each flavor will be scored. The taste standards is using 5 aroma gradation cards, i.e. 5 (very typical of sesame oil), 4 (typical of sesame oil), 3 (quite typical of sesame oil), 2 (less typical of sesame oil), and 1 (not typical of sesame oil).

   The color of oil. The color is measured using yellow gradation card and then each grade of colo will be scored. The standard of color that using in the oil color observations is 5 (very bright), 4 (brighter), 3 (bright), 2 (less bright), and 1 (very less bright). The step of this research can be seen in Figure 1.

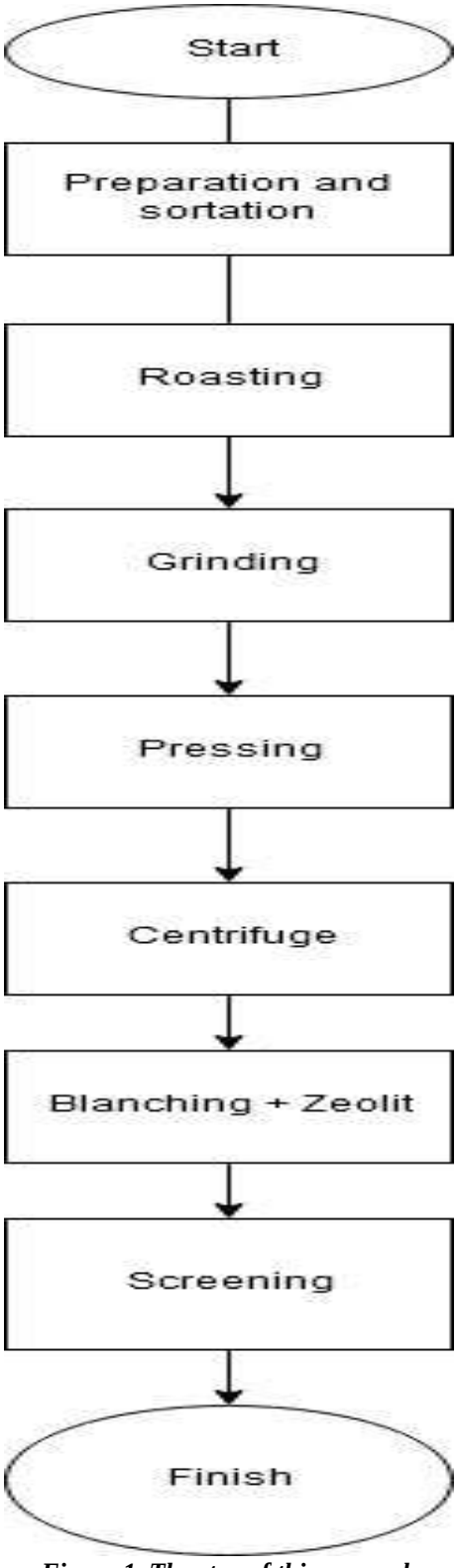

Figure 1. The step of this research

RESULTS AND DISCUSSION

The result shows that there are any interaction between temperature and varieties on the pulp weight. The highest pulp weight is SBR1 with the temperature is 110ºC and the lowest is Winnas 1 with temperatue 110ºC. The interaction graph can be seen in Figure 2.

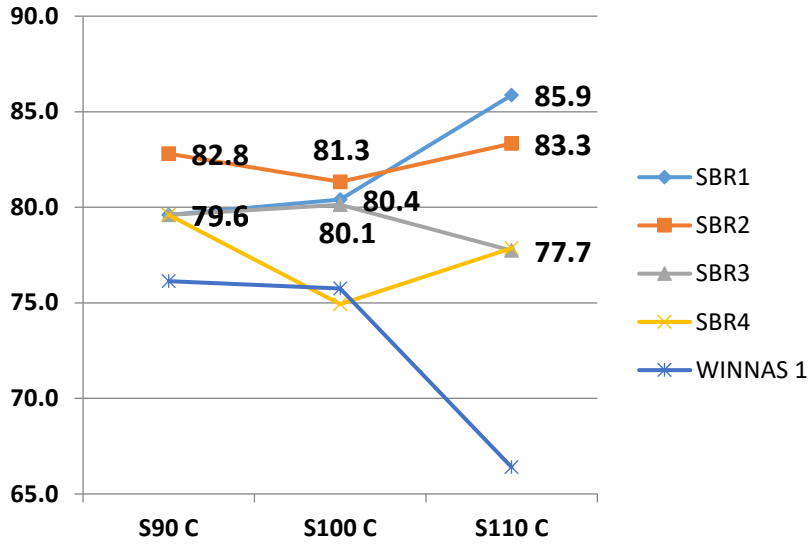

Figure 2. The interaction between temperature and variety on the weight of pulp

The result of the effect of temperature and variety on oil volume shows a real interaction. Winnas 1 at temperature 110ºC shows the highest oil volume is 42.86%, while the lowest oil volume is SBR3 at temperature 110ºC is 23.90%. The interaction between temperature and variety on oil volume parameter can be seen in Figure 3.

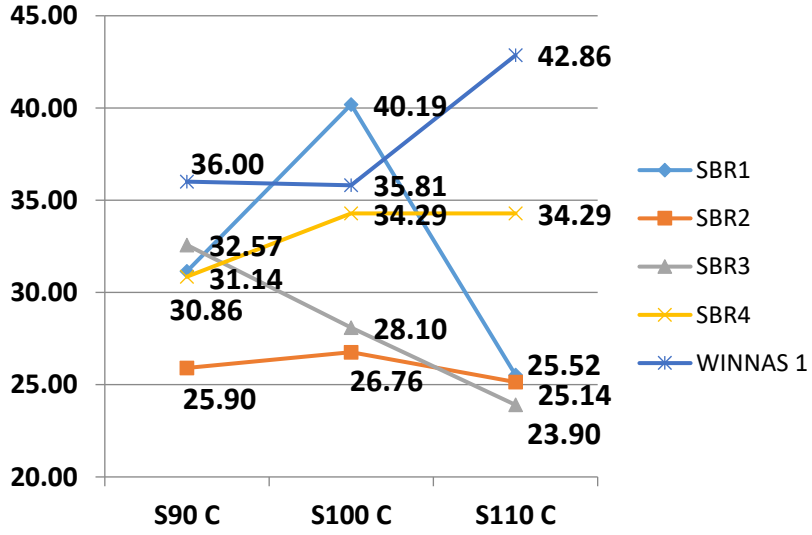

Figure 3. The interaction between temperature and sesame variety on oil volume parameter

The result of the effect of zeolit dose and sesame variety on weight of pulp show the interaction is real. The use of 15% zeolite and SBR2 varieties showed the highest pulp weight, which is 89.5 g, while the lowest pulp weight is zeolit dose 25% and WINNAS 1 which reached 67,2 g. The average results can be seen in Figure 4.

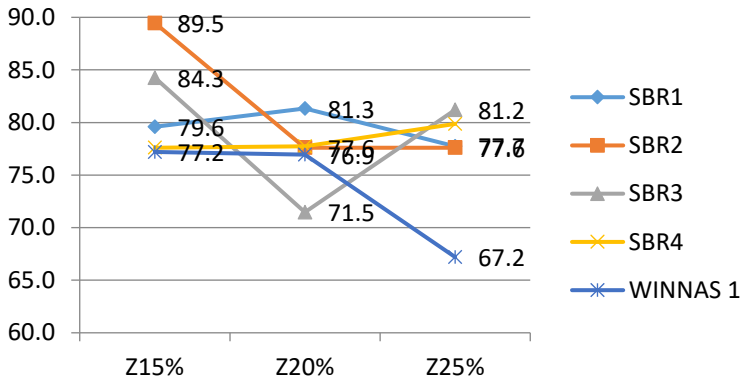

Figure 4. The interaction between zeolite and the weight of pulp

The result of the effect between doze of zeolite and sesame variety on oil volume parameter showed a real interaction. Using the zeolite 25 % and SBR1 variety give the highest oil volume which is 42.67 g, while the lowest oil volume get from zeolite 20 % and SBR 3 variety which is 21.33 g. The results can be seen in Figure 5.

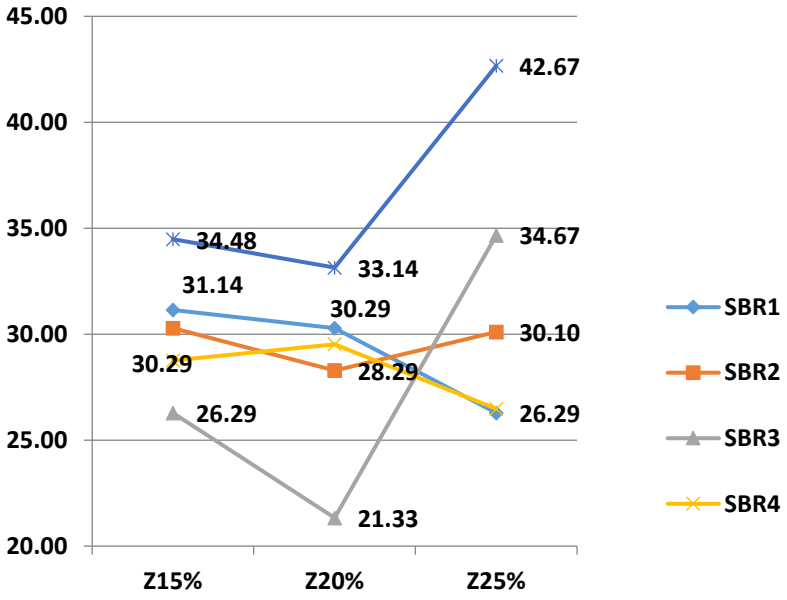

Figure 5. The interaction effect between dose of zeolite and sesame variety on oil volume

The result of the effect between doze of zeolite and temperature on pulp weight showed a real interaction. The combination of zeolite 25 % and temperature 110^0C, give the highest pulp weight which is 86.3 g, while the lowest pulp weight got from combination of zeoilte 25% and the temperature 100^0C which is 71.5 g. The results shown in Figure 6.

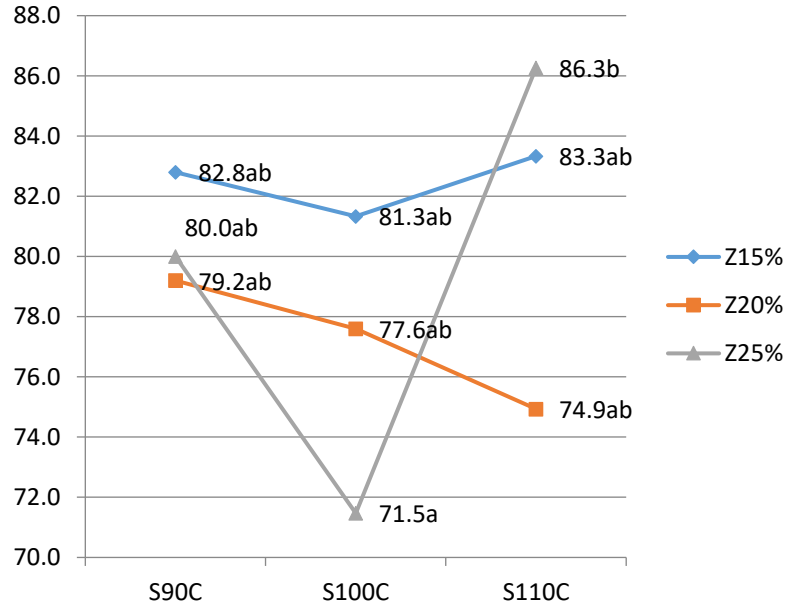

Figure 6. The interaction between zeolite and temperature to pulp weight

The result of combination doze of zeolite and temperature to oil volume did not show any real interaction. The use of zeolite also did not show any significant difference, but the highest value with the use of zeolite 15% of the oil volume was 25.94%. The effect of temperature on oil volume did not show any significant difference, the temperature of 90 0C showed the highest volume of oil which was 28.48% and the lowest volume of oil at 100 oC which reached 25.46%. The results given in Table 1.

Tabel 1. The results of the combination effect of doze of zeolite and temperature to oil volume

Treatment Temperature	Oil volume	
Z15%	25.94	a
Z20%	30.10	a
Z25%	25.84	a
S90C	28.48	a
S100C	25.46	a
S110C	27.94	a

Note: The same alphabet means no significant difference using Duncan Test 0.5%

The result of the effect between doze of zeolite, variety, and temperature on oil color did not give any real interaction. The results of the effect doze of zeolite and variety can be seen on Table 2.

Table 2. The results of sesame oil color

Treatment	Average Score
Varieties	
SBR1	10,24a
SBR2	9,93a
SBR3	9,94a
SBR4	9.90a
WINNAS1	9.91a
Zeolite dose	
$Z_{15\%}$	10,00a
Z_{205}	9,99a
$Z_{25\%}$	9.98a
Temperature	
$S_{90}{}^{0}c$	10,04a
$S_{100}{}^{0}c$	10,01a
$S_{110}{}^{0}c$	10,00a

Note: The same alphabet means no significant difference using Duncan Test
0.5%

The results of the analysis showed a combination of varieties and temperature, varieties with zeolites showed significant differences in the weight parameters of the volume of oil pulp, it was assumed that each variety had different properties, so it had different oil contents. While its effect on the high temperature of oil in a material, by increasing the temperature of the release of oil particles is higher, due to the low temperature of oil the viscosity and will produce a greater yield. The size of the volume of oil also depends on the source of the material used. When shown by (indarti, Arpi, Husna, & Budijanto, 2008), (Indarti, 2007), that is what is meant by the temperature of cocoa butter oil, (venter, Kuipers, & De Haan, 2007), explains how to make it easier for the oil to escape from the matrix of cells ingredients . The effect of zeolet as absorbent is very real on the interaction of pigments in oil. Increasing the absorbent dose correlates positively with the amount of pigment lost.

CONCLUSION

The analysis shows that the quality of sesame oil is very important for the basic ingredients and technological assistance provided. The treatment of zeolite, handling temperature and varieties gave a significant increase in high quality, pulp and oil volume, except for the color of sesame oil. The end result of sesame oil is a sesame oil supplement product which is very potential to be made as a trading commodity

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