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The Effect of Turmeric Extract (*Curcuma Domestica* Val) Against the Durability of Yellow Rice Storage

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Abstract. Yellow rice is a traditional food in some regions in Indonesia. Yellow rice with the addition of turmeric and spices which can longer shelf life of savings because it has antibacterial activity and spices The purpose of this study was to determine the effect of turmeric extract (*Curcuma domestica* Val) to extend shelf life of yellow rice.The samples used were handmade yellow rice with or without any spices with turmeric extract concentration of 1.8% and 2.4%. The tests in this study were organoleptic tests carried out every 3 hours, microbial growth test that observed every day and inhibitory test of turmeric extract with a concentration of 1.8% and 2.4% to the fungi that isolated from yellow rice by using the Total Plate Count method. Research showed that turmeric extract concentration and the addition of spices affect the longer shelf life of yellow rice store. High more and more concentration of the turmeric extract can made longer the shelf life of yellow rice either through organoleptic and also Total Plate Count. The shelf life of yellow rice without spices with turmeric extract concentration of 1.8% and 2.4% were 30 and 33 hours, while the yellow rice added of spices with the same concentration of turmeric extract were 36 and 39 hours.

Keywords: Traditional food, yellow rice, turmeric, shelf life

Abstak. *Nasi kuning adalah makanan tradisional di beberapa daerah di Indonesia. Nasi kuning dengan penambahan sari kunyit dan bumbu dapat memperpanjang daya tahan simpan karena bersifat antibakteri dan memberikan aroma yang khas. Tujuan penelitian ini adalah untuk mengetahui pengaruh sari kunyit (Curcuma domestica Val) terhadap daya tahan simpan nasi kuning. Sampel yang digunakan adalah nasi kuning yang dibuat sendiri yang diberi bumbu dan tanpa bumbu dengan konsentrasi sari kunyit 1,8% dan 2,4%. Pengujian yang dilakukan adalah uji organoleptis yang dilakukan setiap 3 jam, uji pertumbuhan mikroba yang diamati setiap hari dan uji daya hambat sari kunyit dengan konsentrasi 1,8% dan 2,4% terhadap jamur hasil isolasi dari nasi kuning dengan metode Angka Lempeng Total. Hasil penelitian menunjukkan bahwa konsentrasi sari kunyit dan penambahan bumbu dapat memperpanjang daya tahan simpan nasi kuning. Makin tinggi*

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konsentrasi sari kunyit maka daya tahan simpan nasi kuning semakin lama, baik secara organoleptis maupun Angka Lempeng Total. Nasi kuning tanpa bumbu dengan konsentrasi sari kunyit 1,8% dan 2,4% bertahan sampai 30 dan 33 jam, sedangkan nasi kuning yang diberi bumbu dengan konsentrasi sari kunyit yang sama dapat bertahan sampai 36 dan 39 jam.

Kata kunci: *makanan tradisional, nasi kuning, kunyit, daya tahan simpan*

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1. Introduction

Preservative additives are substances used to prevent undesirable changes in foods during storage. Consumer demand for the food tends to nutritious, artificial additive free and has a long shelf-life. This situation is the reason for pressure on researchers to study alternative additives to obtain safe and healthy food [1]. The importance of natural preservative compounds is increasing due to the more extensive use of such compounds in food rather than synthetic compounds. Preservatives in this case are also called Antimicrobials [2].

Food is a basic requirement for every human being, because it contains compounds that are very necessary to restore and repair damaged body tissue, breeding and producing energy for the benefit of various activities in life. Rice is a staple food for most of Indonesia's population. Yellow rice is a traditional food in several regions in Indonesia. Like in Bali, Manado, Kalimantan and the Island of Java. Yellow rice is made from rice, turmeric and herbs such as bay leaves, kaffir lime leaves, pandan leaves and lemongrass [4].

Turmeric as a spice has been widely used by the people of Indonesia as a coloris in foods such as yellow tofu and yellow rice. Apart from being used as natural coloring in food, Turmeric also contains bioactive compounds of essential oils which have the potential to be antimicrobial [4]. Previous studies reported that Turmeric extract has a significant effect on microbial inhibition of tilapia (*Oreochromisniloticus*) isolates thus increasing the shelf life of raw fish to the maximum [4]. The other studies also shows that the shelf life of raw wet noodles with the addition of turmeric (*Curcuma domestica*Val) extract does not exceed the maximum according to SNI namely 10^4 CFU/g [8].

2. Materials and Methods

2.1 Materials

The materials used in this study were turmeric, white rice, lemongrass, bay leaves, kaffir lime leaves, pandanus leaves, s alt, Potato Dextrose Agar (Oxoid, UK), Pepton Dilution Fluid

(Oxoid, UK), Distilled Water and Ethanol 75%.

2.2 Preparation of turmeric extract

Turmeric used is fresh turmeric taken from the Sidikalang area of Dairi district, which was 9 months old. Fresh turmeric was washed and weighed as much as 100 grams, shredded and squeezed then put into a volumetric flask 500 ml and then by adding water until the volume was obtained 500 ml and the concentration of turmeric extract was 20% b/v. The turmeric extract was diluted to several concentrations of 0.6, 1.2, 1.8, 2.4, 3 and 3.6 % v/v.

2.3 Preparation of yellow rice with spices at the concentration of turmeric extract 1.8% v/v and 2.4% v/v

About 100 grams of rice were washed and then drained and put into Rice cooker, then added turmeric extract with a concentration of 1.8% v/v as much as 30 ml, added spices and 150 ml of water. Cook until the rice was cooked, lift and move into container. The same was done for yellow rice with a concentration of turmeric extract 2.4% v/v.

2.4 Preparation yellow rice without spices at the concentration of turmeric extract 1.8% v/v and 2.4% v/v

100 grams of rice were washed and then drained and put into Rice cooker, then added turmeric extract with a concentration of 1.8% v/v as much as 30 ml, and added 150 ml of water. Cook until the rice was cooked, lift and move into container. The same was done for yellow rice with a concentration of turmeric extract 2.4% v/v.

2.5 Organoleptic Test

Organoleptic test of yellow rice such as aroma, colors, consistency and fungal growth of yellow rice. For consistency and colors visually, and for aroma by smelling an aroma yellow rice [2]. Organoleptic test was carried out every 3 hours during storage.

2.6 Test the Total Plate Number of Yellow Rice

An amount of 1 gram of sample was weighed aseptically, then 9 ml of PDF was added, and homogenized with a stomacher for 30 seconds to obtained final concentration of 10^{-1}. Prepared 5 or more tubes, each of which was filled with 9 ml PDF. The results of homogenization in the preparation of samples which were 10^{-1} dilutions were pipette 1 ml into test tube, shaken homogeneously until a 10^{-2} dilution was obtained. Next dilution was made up to 10^{-6}. From each dilution of 1 ml pipette into a petri dish and repeated three times, 15-20 ml of PDA media was poured into each petri dish. The petri dish was immediately shaken and rotated so that the

suspension was spread evenly.To determine the sterility of the media and the diluent, a control test (blank) was made. In a petri dish filled with 1 ml diluent and media, on the other petri dish only media was filled. After the media solidified, the petri dish was incubated at 22 - 25ºC for 24 - 48 hours. After that the number of colonies that were grown was observed and calculated [6].

2.7 Isolation of fungi from Yellow Rice

The Mushrooms were isolated from yellow rice and planted in media agar using ose needles, incubated at 22ºC for 48 hours [6].

2.8 Identification of Fungi

The fungi that the result of isolation was taken one oseand put on the glass object and then added 1-2 drops of distilled water then covered with a Glass Cover and viewed under a microscope [6].

2.9 Anti-fungal activity of turmeric extract to decrease the amount of fungi isolated from yellow rice

The dilution of 10^{-4} was pipette piped 0.1 ml and put into a petri dish, then diluted 0.1 ml of turmeric extract with concentration 1.8%. Then the PDA media was poured into the petri dish, rotated so that the suspension was mixed well and incubated in an incubator at 22ºC for 48 hours. The number of colonies was calculated by the Colony counter. The same was done with the addition of turmeric extract with a concentration of 2.4%, testing was repeated three times [7].

3. Result and Discussion

3.1 The Effect of Turmeric Extract Concentration and Addition of Seasoning Against Yellow Rice Durability.

The results of the organoleptic test and total plate number performed on yellow rice with and without addition spices and white rice (control) during storage can be seen in Table 1.

Table 1 shows that there is an influence of the concentration of turmeric extract and the addition of spices to the durability of yellow rice storage. Based on the data, the yellow rice with concentrations 1.8% v/v and 2.4% v/v of turmeric extract by adding spices show the slower changes of yellow rice organoleptics like aroma changes, moisture and fungus growth than the yellow rice without addition spices, because by added spices such as bay leaves, kaffir lime leaves, pandan leaves and lemongrass also contain essential oils that are antimicrobial thus increasing the activity of turmeric extract in extending the durability of yellow rice storage [8].

Table 1. The results of the organoleptic test and total plate number of yellow rice with adding spices and without spices during storage.

No.	Turmeric extract concentration	Organoleptic properties and total plate number of yellow rice (cfu)																
		Time (Hour)																
		3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51
1.	White rice (Control)	$21x10^1$ (√)	√	√	√	√	√	√	√	$45x10^2$ (√)	+	++	++	+++	+++	+++	+++	$52x10^5$ (+++)
2.	1,8% v/v	$19x10^1$ (√)	√	√	√	√	√	√	√	$31x10^2$ (√)	√	+	+	++	+++	+++	+++	$42x10^5$ (+++)
3.	2,4% v/v	$15x10^1$ (√)	√	√	√	√	√	√	√	$27x10^2$ (√)	√	√	+	+	++	+++	+++	$34x10^5$ (+++)
4.	1,8% v/v +B	$8x10^1$ (√)	√	√	√	√	√	√	√	$11x10^2$ (√)	√	√	√	+	++	+++	+++	$27x10^5$ (+++)
5.	2,4% v/v +B	$4x10^1$ (√)	√	√	√	√	√	√	√	$9x10^2$ (√)	√	√	√	√	+	++	++	$20x10^5$ (+++)

Note :

+ B : Adding spices

√ : Still good (not smelly, not wet and not growing fungi yet)

\+ : A little smelly, not wet and not growing mushrooms yet

++ : It has a smell, is slightly wet and has not grown mushrooms yet

+++ : It has a smell, is wet and grows mushrooms

The difference in the concentration of turmeric extract added also organoleptically shows differences in shelf life, yellow rice with a concentration of 2.4% v/v turmeric extract has a longer shelf life compared to yellow rice with concentrations of 1.8% v/v turmeric extract both those with spices and those without spices. The yellow rice that was given spices with a concentration of turmeric extract 2.4% v/v can increase the durability of yellow rice storage up to 39 hours. Frazier and Westhoff reported states that preservative activity is influenced by the concentration of preservatives [1].

The data also show that yellow rice that adding spices was more resistant to microbial growth because the number of microbes that grow during storage was less. This might be due to the presence of spices such as bay leaves, kaffir lime leaves, pandan leaves and lemongrass which contain essential oils that are antimicrobial so that the addition of these spices causes additions or

potentiation of turmeric extract, so that the antimicrobial activityes are stronger to inhibit microbial growth in yellow rice during storage [6].

3.2 Identification of Microbes Isolated from Yellow Rice

The results of identification carried out using a microscope have the characteristics of not having a septate, black spores and when compared to standard fungus in the laboratory [4], the fungus has the same characteristics as the fungus *Rhizopus sp*.

3.3 Activity of Turmeric Extract Inhibitory on Isolated fungi growth from Yellow Rice

The result of the inhibition activity of turmeric extract against the growth of *Rhizopus sp* in PDA media during storage can be seen in Figure 1.

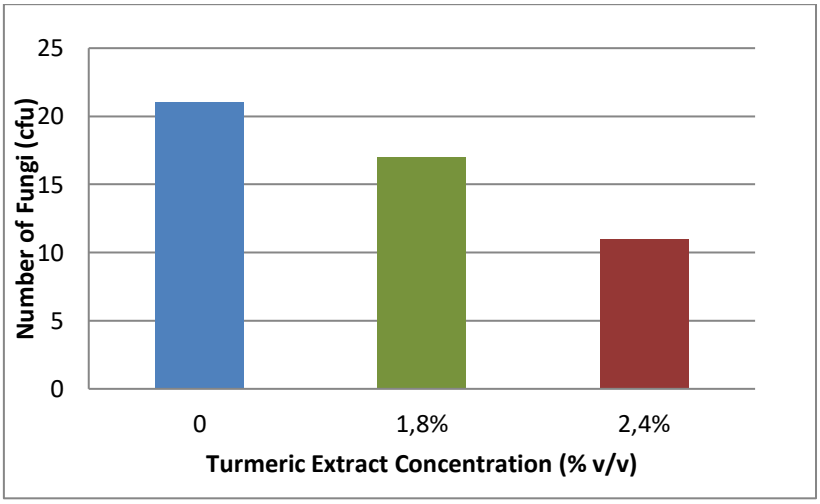

Figure 1. Graph of inhibitory activity of turmeric extract on fungal growth from yellow rice

Figure 1 shows a decrease in the number of fungal colonies where the number of fungal colonies of *Rhizopus sp* without the addition of turmeric extract there are 22 colonies, the number of fungal colonies after adding 1.8% turmeric extract are to 17 colonies and after adding turmeric extract the concentration of 2.4% v/v number of fungus colonies that grew into 11 colonies. This shows that turmeric extract at a concentration of 1.8% and 2.4% v/v has the effectiveness of inhibiting the growth of fungal colonies *Rhizopus sp*. Turmeric bioactive compounds that act as antimicrobials are essential oils, curcumin, desmetoxycurcumin, bidesmetoksikurkumin [8].

4. Conclusion

The yellow rice by adding spices with a concentration of 1.8% v/v and 2.4% v/v turmeric extractare effectively inhibited the growth of fungi thus increasing the shelf life of yellow rice in storage.

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