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# ANALYSIS OF TOTAL CARBOHYDRATE CONTENT OF SINGLE CELL PROTEIN PRODUCED BY UTILISING *OKARA*

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## ABSTRACT

*Okara* is a byproduct of soymilk industry, annually it is produced in large quantities. *Okara* acts as a waste for soymilk industries and possess a big disposal problem. In the present investigation *Okara* was used in three different combinations along with wheat grits. In the first combination 3 parts of *Okara* and 1 part of wheat grits was used, in the second combination 1 part of *okara* and 1 part of wheat grits was used and in the third combination 1 part of *Okara* and 3 parts of wheat grits was used. The three combinations were inoculated with two food fungi viz. *Rhizopus oligosporus* and *Aspergillus oryzae* respectively for producing single cell protein.

The single cell protein produced in the three combinations was analysed for the total carbohydrate content. The maximum carbohydrate content was obtained with combination of 3 parts of *Okara* and 1 part of wheat grits, incase of both *Rhizopus oligosporus* (4.98%) and *Aspergillus oryzae* (5.02%).

**Keywords :** Single Cell Protein, Total Carbohydrate content, *Okara, Rhizopus oligosporus* and *Aspergillus oryzae.*

In the modern world fermentation technology is used for large scale culture of microorganisms which can be used as a direct source of high protein food, and is known as single cell protein (SCP). Suitability of SCP for feeding human beings has been studied by Kacmpfel *et al.*, (1995)[4]. An obvious use of fermentation technology is processing of byproducts (waste products) obtained from industrial and agricultural products. In the present investigation o*kara* was used, which is a byproduct of soymilk industries. The high moisture content of o*kara* makes it unsuitable to be utilized (Shurtleff and Aoyagi, 1979)[10]. However, nutritional composition of o*kara* favours its utilization. It contains 76.6% moisture, 19.91% protein, 8.37% oil, 9.53% carbohydrate and 2.82% starch. Major minerals like calcium, iron, copper and zinc also increases its nutritive value.

O*kara* has been used by various investigators for producing different fermentation products. Fujiwara and Takemoto (1996)[2] studied the composting method for tofu refuse (o*kara*), using an air tight composting plant. Matsuo, M. (1997)[6] has reported the *in vivo* antioxidant activity of o*kara* by *A. oryzae*. Fuh-Juin Kao *et al.,* (1998)[3] has reported the fermentation of o*kara* by lactic acid bacteria, with the addition of molasses and macerating enzymes. Miyamura *et al.,* (1998)[7] examined the fibrinolytic activity of natto produced from o*kara* fermented with *Bacillus subtilis*. A process was developed for preparing better quality soymilk and o*kara* by Nishimura *et* al., (1998)[8]. Kinoshita *et al.,* (1985)[5] has used o*kara* for the production of riboflavin and lipase. Sawano (1999) has developed a process for producing functional o*kara* milks and functional tofu from o*kara*. Yousufi *et al.,* (2003) produced SCP using o*kara,* by controlling its moisture content.

Taking the above evidences into consideration, an attempt was made in the present investigation to produce SCP by using o*kara* and analyse its carbohydrate content.

The production of o*kara* and soymilk is described in Figure 1. O*kara* and wheat grits were mixed in three different ratios to produce the following three combinations.

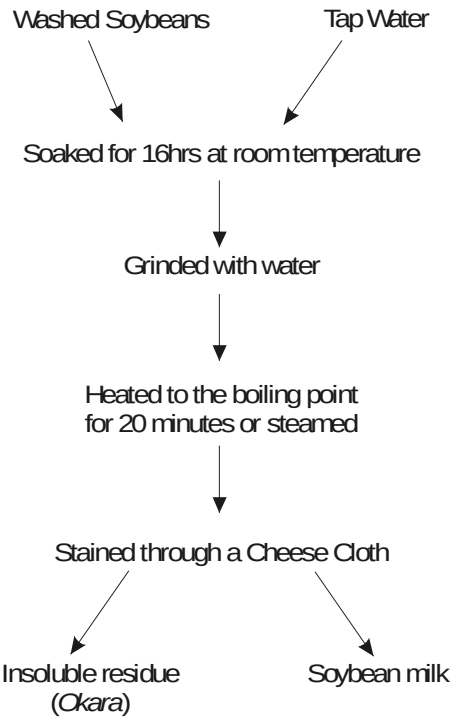


**Fig. 1 Showing okara and soymilk production**

**Table 1 : Combinations of *Okara* and wheat grits**

| S. No. | Combination ratio | Okara (g) | Wheat grits (g) |
|---|---|---|---|
| 1. | 3:1 | 150 | 50 |
| 2. | 1:1 | 100 | 100 |
| 3. | 1:3 | 50 | 150 |

The combinations of *Okara* and wheat grits were filled in petriplates, which were autoclaved. The combinations were then inoculated with two food fungi viz. *R. oligosporus* and *A. oryzae* respectively. The inoculated combinations were thereafter incubated until white cottony mycelium is produced on them. After this samples were removed from each combination and analysed for the total carbohydrate content. The total carbohydrate content was determined by AOAC method (1984).

The total carbohydrate content in different combinations, in case of *R. oligosporus* and *A. oryzae* are given in Table 2 and 3 respectively.

**Table 2 : Total carbohydrate content in the three combinations with *R. oligosporus***

| Organism | Okara/ wheat grits (in grams) | Total Carbohydrate Content (per 100g substrate) |
|---|---|---|
| *R. oligosporus* | 150/50 | 4.98 |
| | 100/100 | 4.95 |
| | 50/150 | 4.90 |

**Table 3 : Total carbohydrate content in the three combinations with *A. oryzae***

| Organism | Okara/ wheat grits (in grams) | Total Carbohydrate Content (per 100g substrate) |
|---|---|---|
| *A. oryzae* | 150/50 | 5.02 |
| | 100/100 | 5.01 |
| | 50/150 | 4.99 |

The results in the Table 2 depicts that the combination of 3 parts of *Okara* and 1 part of wheat grits contained maximum carbohydrate content (4.98%), with *R. oligosporus*. The results in Table 3 depicts that the combination of 3 parts of *Okara* and 1 part of wheat grits contained maximum carbohydrate content (5.02%), with *A. oryzae*. Hence, the combination ratio 3;1 shows maximum carbohydrate content for both *R. oligosporus* and *A. oryzae.*

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