INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 12, No. 6, p. 269-274, 2018

RESEARCH PAPER OPEN ACCESS

Use of rejects of date palm factories to bakery yeast production

Mohammed Ahmad Bkary[1], Abd-El-Rahman Metwaly[1,2*], IhebChakroun[1], Muneeruddin Syed[1], Hesham Sayed Ghazzawy[2,3]

[1]*Administration of Prevention & Environmental Health. Al Madinah, Saudi Arabia*

[2]*Central Laboratory of Date Palm Researches and Development, Agricultural Research Center, Ministry of Agriculture, Giza, Egypt*

[3]*Date palm Research Center of Excellence, King Faisal University, Saudi Arabia*

Key words: Rejects of date palm factories, Bakery yeast, PDA, Stirring, Plate count, Spectroscopy.

http://dx.doi.org/10.12692/ijb/12.6.269-274 Article published on June 24, 2018

Abstract

In this paper, we aim to study different compositions from Rejects from date palm factories and with mix percentage to improve its use as alternative in baker yeast production. We used different date meat and date seed mixtures (from 0% to 100% of each component) as a commercial bakery yeast incubation media and PDA Media as a control. Different official methods (Stirring, plate count and Spectroscopic) were used to read results. Different date meat and date seed mixtures give various results. these results depend to physicochemestry composition and we found that the mixtures (75% date meat+25% date seed) is the best media to give an optimal bakery yeast production througt yeast colony number and absorbance after incubation. This best mixture is the nearest to palm date and to the real composition of date factories Rejects.

* **Corresponding Author:** Abd-El-Rahman Metwaly ✉ ab.metwaly40@gmail.com

Introduction

Annually, in Middle East, 100 million palms give about 6 million tons of date palm (*Phoenix dactylifera* L.) . The major problem of the production of date palm is related to processing because only about 7.4% of the production is manufactured. By using unspecialized equipment in the palm date sector, the quality is not at the required level (El-Habbab *et al.*, 2017). That is why, quantity of palm date waste is very high and use of it is very profitable due to its availability and low commercial value. In this regard, several researches have been conducted to use best environmental practices. To achieve outputs that can be utilized, as the investment of these wastes supports the strategy of sustainability, which is concerned with the preservation of the environment not to burn or bury the waste, because of the problems that contradict the rules and laws that work on a global scale, and committed by Arab countries (Barreveld, 1993).

The main objective of this process is to reduce the volume of waste, to preserve the environment by recycling. So "The date palm waste in producing the date crop is a great burden on producers". There was a need to find alternatives by the establishment of conversion projects for those wastes, for use in many areas as they are very sources of fiber and sugars. Through investigation of some palm tree farms and palm date factories, we found that single palm leaves an average of 23 kg of palm date waste per year. This indicates the huge volume of waste which is a real environmental problem (Amer *et al.* 2006).

Palm date waste can be used in different ways as good substrates to produce bakery yeast. And this is because it contains minerals such as potassium, magnesium, sulfur, phosphorus, iron, calcium and chloride (Aleid *et al.*, 2014). Na and other trace elements and some essential elements. Carbohydrate content amounting to 65–87% obtained from dates, which are sugars and are mainly comprised of glucose and fructose, with are easily assailable to most microorganisms (Sawaya, 1986). Protein from palm dates is suitable source of nitrogen, which is be potentially used for bakery yeast production. Dates contain vitamins, which are also important for yeast growth. (Aleid *et al*, 2014). In addition, the yeast cells contain small amounts of vitamin B complex. These elements are essential for the production medium in sufficient quantities. This kind of yeast is used in bread making (dough rising) to produce the characteristic loaf as preferred by consumers (Commercial bakery yeasts produced from strains of Saccharomyces cerevisiae). Dough rising occurs as a result of the gases produced by the yeast as it grows within the dough.

The leavening power of the yeast depends on its activity and viability, therefore, the yeast used must be fully active with a high viable cell count. Furthermore, the leavening power of any yeast strain depends on its genetic makeup and on the process of production, and also on the storage conditions (Pyler, 1988). The most important function of bakery yeast in bread making is to leaven the dough during the fermentation process by producing CO2 via the alcoholic fermentation of sugars. Moreover, the yeast produces desirable flavor and aroma compounds as products of secondary metabolism (Evans, 1990). The study aims the possibility of benefiting from the waste that comes out of the date palm factories for the production of baker's yeast and choosing the best suitable environment for the growth and studying the growth curve of the yeast.

Materials and methods

Sample preparation: 30 random samples were collected from date plants in Madinah. Each 10 g sample composition is as follow date meat 100%, date seeds 100% , 75% date seed +25% date meat, 50% date seed +50% date meat and 25% date seed +75% date meat. These samples will be considered later as a culture mediums. From this we did two mediums types: solid (mix 10 g sample and with 15g agar) and suspension (10 g sample in one liter water).

Inoculation and incubation: Yeast suspension is prepared from 1 gram dry yeast added to 100 ml sterile water. It is incubated at 37° C and yeast number is red day after day until the sixth day.

From yeast suspension, after 1, 2, 3 and 6 days growth, we took off 1 ml, we inoculate it on solid culture mediums in petri dish than we incubate it in 30°C growth chamber. Than colony number growth measurement is done. From yeast suspension to, after 1, 2, 3 and 6 days growth, we took off 1 ml, we inoculate it on liquid culture mediums in flask than we incubate it in 30°C growth chamber. Than absorbance mix suspension is done.

Measurement of suspension cells optical intensity (O.D)

The most common method used in the field of research and industrial in determining the mass of cells and depends on this method to determine the amount of light spread in the suspension of cells, AOAC. (1995).

The idea of measurement depends on the ability of small objects (bacteria) suspended in a liquid to absorb light and spread it in the liquid proportional to its concentration. When an optical beam passes through a liquid, it absorbs or reduces the amount of light, so the light from the liquid represents a density indicator called the amount of light reduced by optical intensity (O.D) measured using the spectrometer (Nguyen Thanhdat, 2016). Optical density is the mass of cells. As long as the different bacterial species have differing optical densities, the difference in density is also present among individuals of the same type depending on these two facts by stabilizing the relationship between the optical density of the species and the suspended mass through weight or through the number. Thus, the growth rate of yeast was measured at 620 nm after a day, two, three and six days.

Control media PDA (4g potato powder, 20g dextrose and 15g agar in one liter distilled water, adjust to pH 5 and sterilized at 121°C for 20 minutes).

Statistical analysis

The data were analyzed using SAS software. The means were compared by the Duncan's test. Colonies were then studied in each dilution, followed by the results of the statistical analysis, LSD extraction.

Results

Reading of yeast number colonies after growth

One-day growth

Data in Table 1 shows, in 10^{-6}concentration, that treatment (25% seed +75% meat) gives highest colony number. And treatment (100 % seeds) gives the lowest colony number. While, in 10^{-7}concentration, highest colony number is for (75% seed +25% meat), (50% seed +50% meat) and for (25% seed +75% meat) treatments and lowest colony number was for 100 % seeds treatment.

Table 1. Number of yeast colonies after one-day growth.

Treatment s	10-7	10-6
PDA	1	22b
100 % seeds	0	0 f
100 % meat	1	10 e
75% seed +25% meat	3	15 d
50% seed +50% meat	3	20 c
25% seed +75% meat	3	30 A

L S D at 5% = 0.5348 to concentration, L S D at 5% = 0.926 to Treatment.

Two-day growth

Likewise, data in Table 2 (After 2 days growth) shows, in 10^{-6}concentration, that treatment (25% seed +75% meat) gives highest colony number. And treatment (50% seed +50% meat) gives the lowest colony number. While, in 10^{-7}concentration, highest colony number is for (75% seed +25% meat), (50% seed +50% meat) and for control treatments (PDA) and lowest colony number was for (50%seed +50% meat) treatment.

Table 2. Number of yeast colonies after two days growth.

Treatments	10^{-7}	10^{-6}
PDA	TNC	TNC
100 % seeds	80	133
100 % meat	61	210
75% seed +25% meat	54	250
50% seed +50% meat	13	60
25% seed +75% meat	120	TNC

L S D at 5% = 3.9159 to concentratio, L S D at 5% = 6.7826 to Treatment.

Three-day growth

On the other hand, data in table 3 (After 3 days growth) shows, in 10^{-6}concentration, that treatment Control, (100 % seeds), (75% seed +25% meat) and (25% seed +75% meat) gives TNC colonies. And treatment (100 % meat) gives the lowest colony number. While, in 10^{-7}concentration, Control, (100 % seeds), and (25% seed +75% meat) gives TNC colonies and lowest colony number was for (50% seed +50% meat) treatment.

Six-day growth

And finally, data in table 4 (After 6 days growth) shows, in 10^{-6}concentration, that treatment Control, (100 % seeds), (75% seed +25% meat) and (50% seed +50% meat) gives TNC colonies. And treatment (100 % meat) gives the lowest colony number.

While, in 10^{-7}concentration all treatments give TNC colonies.Reading of absorbance at 620nm after one to six day's growths.

Table 3. Number of yeast colonies after three days growth.

Treatment s	10^{-7}	10^{-6}
PDA	TNC	TNC
100 % seeds	TNC	TNC
100 % meat	5	13
75% seed +25% meat	160	TNC
50% seed +50% meat	3	130
25% seed +75% meat	TNC	TNC

L S D at 5% = 9.4971 to concentration, L S D at 5% = 16.45 to Treatment.

The following Table 5 shows the results of analyses for different measures of absorbance with different yeast growth media (different media of Factory Waste Dates) using Spectrometer at 620 nm Wavelength.

Treatment (25 %seed +75% meat) at (After one day of incubation) is the highest while Treatment (100 % meat) at (After three days of incubation) is the lowest. In a general way best result is for the first day and worst result is for the third day.

Discussion

The results showed that the best treatment for yeast growth is with media composition (75% meat + 25% kernel) after one day growth (incubation for 24 hours) while the lowest growth in this first day was for (100% meat) media.

On the whole, for all treatments after the first day growth are higher than that of the control (PDA).

And it makes sense because the high level of sugar in the growth media leads to an increase in yeast growth and alcohol production as one of the stages of growth (fermentation of sugars).

Table 4. Number of yeast colonies after six days growth.

Treatment s	10-7	10-6	
PDA	TNC	TNC	
100 % seeds	TNC	TNC	
100 % meat	TNC		0
75% seed +25% meat	TNC	TNC	
50% seed +50% meat	TNC		TNC
25% seed +75% meat	TNC	4	

L S D at 5% = 0.1996 to concentratio

L S D at 5% = 0.3456 to Treatment.

Alcohol is a product of secondary metabolic products (CO_2 + alcohol) (Siti*et al.*, 2017). Where the media composition has more negative effect for the third day and the lowest result was for (100% meat) media composition. This lowest result (100% meat media composition) is due to high content of sugar and lack of amino acid in media. Proteins composition of date meet is about 1,75%+-0.06 and total Suger 66,5%+-1,31 (Ouled El Hadj M. d *et al*, 2006), (Wahid HERCHI1 *et al*, 2014).

Table 5. Reading yeast growth after 1, 2, 3 and 6 days of incubation.

Absorbance 620 nm 100g water,1g yeast and 10g media	After one day of incubation	After two days of incubation	After three days of incubation	After six days of incubation	Mean
PDA	1.367 z	0.956	0.463	0.971	F 0.9392500
100 % seeds	2.265	1.645	1.269	1.5	A 1.6697500
100 % meat	1.741	1.017	0.411 z	1.5	E 1.1672500
75% seed +25% meat	2.107	1.111	1.608 a	0.608 z	D 1.3585000
50% seed +50% meat	2.53	1.712 a	1.255	0.737	C 1.5585000
25%seed +75% meat	2.667 a	0.934 z	1.196	1.6 a	B 1.5992500
Mean	A 2.1128333	B 1.2291667	D 1.0336667	C 1.1526667	

LSD 5% treatment = 0.0017, LSD 5% days= 0.0014.

Amino acids and essential elements for growth in date seed (kernel) were provided by the other date component. Date Seed composition are Protein (from 5.56 to 5.17%), oil (from10.19 to 12.67%), Ash (from1.15 to 1.12%), total carbohydrate (from 83.1 to 81.0%), major unsaturated fatty acid was oleic acid (from 41.3 to 47.7%), main saturated fatty acid was lauric acid (17.8%) and Capric, myristic, myristoleic, palmitoleic, stearic, linoleic and linolenic acids were also found. These results showed that date seed oil could be used in cosmetic, pharmaceutical and food products like Baker yeast. (Besbes *et al*, 2004), (Besbes, 2004), (Walid Herchi1 *et al*, 2014).When available in high concentrations, sugar produces a large amount of alcohol in the medium as a secondary metabolite. Alcohol inhibits the growth of yeast as is clearly indicated, where the growth media was 100% meat composition when dilution 10^6, there is no yeast growth, while at the time of dilution 10^7, after incubation on same media revealed more yeast growth than the above reading. And that was because of alcohol concentration decrease in suspension medium. From that results we conclude the need for the amino acids source which is already present in date residues from the kernel and the best medium for the growth of yeasts is (25% nuclei + 75% meat) composition. The media composition of 25% kernel and 75% meat from date seem to be the nearest to the

natural composition of reject of the date factories (Besbes *et al*, 2004). When using the optimum composition found in this work. We need further experimentation to avoid industrial production problems to yeast production from rejects of the date factories.

References

Adlan HA.1994**.** Date Palm Culture in Sudan. Horticulture Department Report. Ministry ofAgriculture, Khartoum, Sudan.

Aleid SM, Zhen-Xing, Shi, Lu-E, Tang. 2014. Date and their processing byproducts as substrates for bioactive compounds production. Braz. arch. biol. technol.**57(5),** 706-713.

Amer J, Hussain FA, 2006. Iraqi Date Industry Marketing and Post-harvest Issues, p. 64. http://www.iraqi-datepalms.net

AOAC.1995**.** Official methods of Analysis AOAC. 16th Ed. Association of Official Analytical Chemists, Washington D.C.

Barreveld WH. 1993**.**Date palm products. FAO Agricultural Services, Bulletin No. 101. Food and Agriculture Organization of the United Nations, Rome.

Besbes S, Bleckerb C, Deroanneb C, Drira N, Attiaa H.2004. Date seeds: chemical composition and characteristic profiles of the lipid fraction, Food Chemistry, **84(4),** 577-584.

Besbes S, Blecker C, Deroanne C, Lognay G, Drira NE, Attia H.2004.Quality Characteristics and Oxidative Stability of Date Seed Oil during Storage. Food Science and Technology International, **10,** 333-338.

Evans DV. 1990**.** The wide-spacing approximation applied to multiple scattering and sloshing problems, Journal of Fluid Mechanics, **210,** 647-658.

Duncan DB. 1975. T tests and intervals for comparisons suggested by the data. Biometrics 31, 339-59.

Mohammad SH, Al-Mulhim F, Al-Eid S, Abo El-Saad M, Aljassas F, Sallam A, Ghazzawy HS. 2017.Assessment of Post-Harvest Loss and Waste for Date Palms in the Kingdom of Saudi Arabia**,** International Journal of Environmental & Agriculture Research (IJOEAR), **3(6),** 1-11.

Ouled El Hadj Md. 2006. étude de la production de levure boulangère (saccharomyces cerevisiae) cultivée sur mout de rebuts de dattes, courrier du savoir**7,** 13-18.

Pyler EJ. 1988**.** Baking Science and Technology, 3rded. Sosland Publishing: Merriam, KS.

Nguyen T. 2016**.**Protection de la levure Saccharomyces cerevisiae par un système biopolymérique multicouche : effet sur son activité métabolique en réponse aux conditions de l'environnement, THESE de Doctorat Universtité de Bourgogne, 149.

Siti HM, AzharaR, AbdullaabSA, JamboaH, MarbawiaJ, Azlan G, Ainol A, Mohd F, Kenneth FR. 2017**.** Yeasts in sustainable bioethanol production: A review, Biochemistry and Biophysics Reports**10,** 52-61.

Sawaya WN, Ayaz M, AL-sogair A. 1986**.** Microbiological Quality of Tehineh Manufactured in Saudi Arabia. Journal of Food Protection, **49(7),** 504-506.

Wahid H, Habib K, Sadok B. 2014. Physicochemical properties and antioxidant activity of Tunisian date palm (Phoenix dactylifera L.) oil as affected by different extraction methods, Food Sci. Technol, Campinas **34(3),** 464-470.