Food Research 8 (3) : 1 - 6 (June 2024)
Journal homepage: https://www.myfoodresearch.com

FOOD RESEARCH

RESEARCH PAPER

Chemical and sensory evaluations of energy bar made from purple sweet potatoes and tapioca flour with the addition of Sidempuan salak (*Salacca sumatrana* (Becc.)) fruit

[1]Siregar, N.S., [2,*]Julianti, E., [3]Silalahi, J. and [2]Sinaga, H.

[1]*Department of Agricultural Science, Faculty of Agriculture, Universitas Sumatera Utara, Medan 20155-Indonesia*
[2]*Department of Food Science, Faculty of Agriculture, Universitas Sumatera Utara, Medan 20155-Indonesia*
[3]*Faculty of Pharmacy, Universitas Sumatera Utara, Medan 20155-Indonesia*

Article history:
Received: 1 May 2022
Received in revised form: 4 June 2022
Accepted: 12 January 2023
Available Online: 3 May 2024

Keywords:
Formulation,
Energy bar,
Sidempuan salak,
Sensory evaluation,
Chemical analysis

DOI:
https://doi.org/10.26656/fr.2017.8(3).109

Abstract

Sidempuan salak is a local fruit originating from South Tapanuli, North Sumatra. This fruit has a unique taste of sweet, sour and slightly astringent. This fruit can be consumed fresh or processed into several products, such as flour, drinks and sweets. This study aimed to develop a food-based energy bar from Sidempuan salak fruit (*Salacca sumatrana* (Becc.)). Energy bar formulation was done by blending purple sweet potato flour, tapioca flour, glucose syrup, egg albumen, coconut oil, salt, and dried salak fruit powder at 0 g as the control, 100 g (bar 1), 150 g (bar 2) and 200 g (bar 3). The chemical characteristic analysis showed that the control energy bars (CEB) per 100 g consisted of 63.17 g of carbohydrates, 1.95 g of protein, 13.42 g of fat, 6.40 mg of vitamin C, 248.05 mg of potassium and 381.24 kcal. Energy bar salak 1 (EBS1) had 377.44 kcal with a composition of 68.34 g carbohydrates, 1.71 g protein, 10.81 g fat, 8.00 mg vitamin C and 347.05 mg potassium. Energy bar salak 2 (EBS2) contained 375.49 kcal with 71.48 g carbohydrate, 1.84 g protein, 9.12 g fat, 5.77 mg vitamin C and 368.42 mg potassium. Energy bar salak 3 (EBS3) showed 369.40 kcal with 74.54 g carbohydrates, 1.92 g protein, 7.07 g fat, 9.96 mg vitamin C and 410.24 mg potassium. Based on sensory evaluation, the untrained panellists indicated that ESB3 was the most preferred, even though EBS1 and EBS2 were also very much acceptable. In conclusion, energy bars containing salak (EBS1, EBS2, EBS3) were lower in calories than the control energy bars due to the lower addition of flour. From the data obtained, salak has a good potential to be used as an additional ingredient to develop energy bars.

1. Introduction

Developing new food products using less processed local fruit can create added value product opportunities, diversify food products, reduce crop losses, and increase price certainty for farmers and rural-urban relations. North Sumatra produces Sidempuan salak, usually eaten fresh because of its crunchy texture and unique taste. Sidempuan salak fruit has a sweet, sour, and slightly chelating taste.

Salak is one of the favourable fruits among Indonesians due to its texture, flavour and nutritional contents (Ritonga *et al.,* 2018). This fruit contains various phytoconstituents and vast nutrition, such as sucrose (7.6 g/100 g), fructose (5.9 g/100 g), total sugar (17.4 g/100 g), dissolved-based fibres (0.3 g/100 g), non-dissolved fibres (1.4 g/100 g), total food fibres (1.7 g/100 g), water (80 g/100 g) calories (77 kcal/100 g), protein (0.7 g/100 g), ash (0.6 g/100 g) and fat (0.1 g/ 100 g). The salak fruit is a natural sugar and food fibre source (Saleh *et al.*, 2018; Fendiyanto *et al.*, 2020).

This Sumatranean salak has high antioxidant and antioxidant capacities equal to vitamin C content (Saleh *et al.*, 2018; Fendiyanto *et al.,* 2020). As all-seasonal fruit, salak has a potential feature to be commercialised for the fruits themselves and as a processed product with promising economic features (Ritonga *et al.,* 2018). Salak can also be processed into powder and could be used to bake muffins, cakes, cookies, and flakes in which the flavour has been considered acceptable by the consumers.

Fruits contain many nutrients needed by the body such as carbohydrates, vitamins, minerals and

*Corresponding author.
Email: *elisa1@usu.ac.id*

eISSN: 2550-2166 /
Published by Rynnye Lyan Resources

phytonutrients for metabolic processes. But fresh fruits have a short shelf life, so they need to be processed into processed products to extend their shelf life, and one of them is processed into food bars. The energy bar is a food bar with relatively high energy contents formulated for people who require quick absorption of energy without spending a lot of time during consumption (Tiwari *et al.,* 2017).

Subsequently, the energy bar attracts many people due to its quick-serve, good taste, high nutrition profiles, enticing appearance and convenient packaging (Jetavat *et al.,* 2020). The development of an energy bar may be formulated via a combination of varied fruits free of preservatives and *halal* features (Aljaloud *et al.,* 2020). The energy within the bar could be achieved from carbohydrates, protein, and fats. (Tiwari *et al.,* 2017).

The formulation of the energy bar may be mixed with cocoa butter, stevia, bananas, oranges, peanuts, raisins and wheat. The formulation may support energy fulfilment in a relatively quick process during pre- and post-exercise. Several reports have shown that the energy bar displayed functional features such as high minerals and proteins, low glucose and gluten-free. The stevia within the energy bar functions as natural sweetness, antimicrobial and antibacterial (Chitraka *et al.,* 2017).

The manufacturer of food bars can use the pulp of sapodilla-almond seeds (80:20) to produce quality fruit food bars. This fruit bar formula is added with a sweetener that uses stevia sugar to increase the perception of acceptance (Akesowan *et al*., 2019). Based on this background, this study aimed to develop a new recipe for energy bars from dry Sidempuan salak fruits and to evaluate the nutrient content in energy bars to determine their potential value as healthy dietary energy bars.

2. Materials and methods

2.1 The preparation of dried Sidempuan salak

The skin of Sidempuan salak fruits was peeled and these fruits were cleaned with running water. Then, the flesh fruits were separated from the seeds and the flesh was sliced thinly. The slices of the flesh fruits were placed onto drying shelves separately, and thin fabrics covered the stands as a protector from insects. The drying process was carried out under the sun's rays with the support of a fan to speed up the drying stage.

2.2 Energy bar manufacture and formulation

The preparation of energy bars was carried out following a study conducted by Welli *et al.* (2020) with minor modifications. The product formulation is shown in Table 1. Energy bar formulation was done by blending purple sweet potato flour (50 g), tapioca flour (50 g), glucose syrup (80 g), egg albumen (30 g), coconut oil (30 g), salt (0.2 g), and dried salak fruit. The final composition of each bar was based on the addition of the salak fruit with 0 g as the control, 100 g (bar 1), 150 g (bar 2) and 200 g (bar 3). The homogenous mixture was placed into a mould measuring 8×1.5 cm to get the shape of an energy bar. The energy bar was baked at 100°C for 40 mins. Once the energy bar was cooked, it was removed from the toaster oven and left at room temperature for an hour. The energy bars were packaged in aluminium foil and stored in the refrigerator until sensory-chemical analysis was performed.

Table 1. The formula of the salak energy bar.

Ingredients	CEB	EBS1	EBS2	EBS3
Dried Salak (g)	0	100	150	200
Purple Sweet Potatoes Starch (g)	100	50	50	50
Tapioca Starch (g)	100	50	50	50
Egg Albumen (g)	30	30	30	30
Coconut oil (g)	30	30	30	30
Salt (g)	0.2	0.2	0.2	0.2
Glucose Syrup (mL)	80	80	80	80

2.2 Chemical characteristics of energy bar

Analysis of the chemical properties of the energy bars was carried out using the standard national Indonesia (SNI) procedure and the Mbrio Laboratory work procedure. The chemical characteristics of the salak energy bar examined included the water content (SNI 01-2891-1992, Point 5.1, Gravimetric), total ash content (SNI 01-2891-1992, Point 6.1, Gravimetric), total fats (IKP/K-1, Soxhlet Hydrolysis), protein (SNI 01 -2891-1992, Point 7.1., Kjeltch), carbohydrate (IKP/K-3, By Difference), calories (IPK/K-3, Calculation), crude fibres (SNI 01-2891-1992, Point 11, Gravimetric), vitamin C (IKP/K-11, HPLC), Potassium (IKP/K-7, AAS), total sugar (IKP/K-2, Titrimetric).

2.3 Sensory evaluation

The sensory analysis of the salak energy bar was conducted by panellists to assess appearance, aroma, texture (SNI 01-2891-1992 Point 1.2, organoleptic) and colour tests (SNI 01-2891-1992 Point 1.2, visual). The preference tests were conducted by 30 untrained panellists and 30 futsal athletes. Samples of energy bars were served to these panellists and they were asked to give their preferences for the different salak energy bars according to the following scales: (1) Not very much keen, (2) Not really keen, (3) not keen, (4) Somewhat not keen, (5) Neutral, (6) Somewhat keen, (7) keen, (8) very keen, (9) Very much keen.

https://doi.org/10.26656/fr.2017.8(3).109

2.4 Statistical analysis

The data were analysed using analysis of variance (ANOVA) and continued with the Least Significant Difference (LSD) test using Minitab 17.0 software.

3. Results and discussion

3.1 The evaluation of chemical characteristics of the energy bar

The results of the analysis of the chemical characteristics of the energy bar can be seen in Table 2. The ANOVA results show that the moisture contents of the different energy bars were not the same based on the flour formulas used. The total ash content and fat content of the control energy bar (CEB) differed significantly from the EBS1, EBS2, and EBS3. Significant differences could be seen in the protein content, in which the EBS1 has a higher protein content. Carbohydrates, vitamin C, potassium and total sugar contents were significantly different among the four energy bar formulas.

The water content of salak energy bars 1, 2 and 3 was lower than those in the control energy bar. The moisture decreases with the increasing addition of dried salak into the composition, by increasing the texture densities which lowers the water content. The heating treatments could help water evaporation and can reduce the water content within the processed food-bar product, resulting in a lower level of water that may help to extend the shelf life (Munir *et al.,* 2018), resist the growth of microbes (Rafiu *et al*., 2015), improve the crispness of the bar (Momany *et al.,* 2020), which in turn influences the stabilities and qualities of the bar itself (Munir *et al.,* 2018). Elsewhere, a study by Wicaksono *et al*. (2019) reported that the addition of gembili and mung bean flour would also decrease the water content level in a food bar, as the starch within the flour bond weakly, causing them to be quickly reduced via evaporation or drying.

The ash content level in the energy bar with salak was higher than that in the control bar. A study has reported that a higher amount of oat on a dates-bar raises the ash level content of the dates-bar (Rehman *et al.,* 2020). The ash is an organic residue after water, as the other organic material has been reduced after being oxidised during heating treatment. The minerals would not be damaged, although the heating treatment occurs at high temperatures; subsequently, materials with low volatilities would evaporate quicker than any nutritional materials (Kaur *et al.,* 2018).

The total fat content in the control energy bar was higher than those in the bar with salak addition. This result is in agreement with reports from a previous study that suggested that fruits normally have low levels of fat contents (Bhakha *et al.,* 2019). Various fat contents could be correlated to the different natural compositions that are present in fruits (Agbaje, 2015; Rehman *et al.,* 2020). The fat and protein contents in the formulation of raisins food bar and fig food bar have been reported to be lower than those bars based on red rice, linseed, and almond, as it has been known that fruits commonly contain low fat and protein (Kaur *et al.,* 2018).

The control energy bar had a higher protein level than those in the salak energy bar. This was further corroborated by Torres *et al*. (2011) who found that the protein content of cereal bars using exotic fruits was low. In this study, the addition of dried salak, which is not accompanied by the addition of egg albumens on the dough, may cause the protein contents to be lower than the control energy bars. Thus, adding fruits to the energy bar will not increase protein levels significantly because fruits have low crude protein. For this reason, it is necessary to add protein to fruit snack bars to increase protein bars (Bhakha *et al*., 2019).

The carbohydrate level in the control energy bar was lower than that in the salak energy bar. The higher

Table 2. Chemical characteristics of the salak energy bar.

Characteristics	CEB	EBS1	EBS2	EBS3
Moisture (g/100 g)	20.36±0.08^{a}	17.86±0.12^{b}	16.26±0.29^{c}	15.13±0.61^{d}
Total Ash (g/100 g)	1.11±0.01^{a}	1.28±0.01^{bc}	1.31±0.02^{cbd}	1.35±0.10^{dc}
Total Fat (g/100 g)	13.42±0.09^{a}	10.81±0.75^{b}	9.12±0.34^{c}	7.07±0.37^{d}
Protein (g/100 g)	1.95±0.04^{acd}	1.71±0.04^{bc}	1.84±0.18^{cabd}	1.92±0.13^{dac}
Carbohydrate (g/100 g)	6317±0.05^{a}	68.34±0.72^{b}	71.48±0.26^{c}	74.54±0.42^{d}
Calories (kcal/100 g)	381.24±0.75^{a}	377.44±3.95^{bc}	375.49±3.95^{cb}	369.40±4.21^{d}
Crude Fibres (g/100 g)	0.14±0.01^{a}	0.33±0.08^{bcd}	0.28±0.04^{cbd}	0.31±0.14^{dbc}
Vitamin C (mg/100 g)	6.40±0.03^{a}	8.00±0.14^{b}	5.77±0.08^{c}	9.96±0.60^{d}
Potassium mg/100 g)	248.05±19.39^{a}	347.05±3.95^{b}	36842±11.29^{c}	410.24±12.51^{d}
Total sugar (g/100 g)	23.78±2.12^{a}	29.60±4.91^{bc}	32.24±2.89^{cb}	38.97±1.25^{d}

Values are presented as mean±SD. Values with different superscripts within the same row are statistically significantly different ($p<0.05$).

amount of dried salak added to the dough increased the level of carbohydrates. As carbohydrates are the most common constituents that have been found in an energy bar, this may be due to the usage of enriched-carbohydrates ingredients, such as tapioca starch, glucose syrup, and purple sweet potatoes in our formulations (Prazeres *et al.,* 2020), and purple sweet potato flour. The total sugar level in salak-bars increases as soon as the addition of salak since this fruit is also a natural source of sugar (Saleh *et al.,* 2018). The sugar content contributes to the calories of an energy bar, together with carbohydrates, protein and fat. The energy bar has a potential feature to be consumed by active people, such as an athlete, due to its higher content of carbohydrates and fat (Prazeres *et al.,* 2020; Aljaloud *et al.,* 2020).

The crude fibres of the control energy bar and the salak energy bar varied. The EBS1 had the highest crude fibre content among all the bars, while the control energy bar had the lowest range. The composition of dried salak on the bars may contribute to the increase of crude fibres on the salak energy bars. This study is in agreement with a previous study conducted by Rehman *et al*. (2020), who reported that using date paste on the snack bar can increase the crude fibres.

The control energy bar contains lower vitamin C than the salak energy bar. The vitamin C composition in the salak energy bar increases with the addition of dried salak to the bar. The composition of vitamin C in EBS2 is the lowest among the salak energy bars. One of the possible reasons for this observation was that there could be an uneven distribution due to the uneven mixture of salak in the dough. Salak is one of the sources of vitamin C (400 mg/kg) (Saleh *et al.,* 2018), in which the addition of this fruit into the energy-bar formulation would increase vitamin C levels. It has been reported that the addition of marolo with a high vitamin C would increase the vitamin C level in the snack bar (da Silva *et al.,* 2014). Vitamin C is a source of antioxidants that effectively inhibits radicals (da Silva *et al.,* 2016)

Fruits are the sources of potassium and salak contains potassium too (11.339 mg/kg) (Saleh *et al.,* 2018; Prazeres *et al.,* 2020). The addition of salak as one of the compositions in the energy bar may influence an increase in potassium in the energy bar. Micronutrients are constituents required for physiological features and to maintain nutritional balance within the body. Minerals cannot be synthesised and are supplied from the food (da Silva *et al.,* 2016).

3.2 The sensory evaluation of the energy bar

The panellist's analysed the salak energy bar for their normal texture, aroma, taste and colour. The test results about the favourability of the salak energy bar by the untrained panellists are displayed in Table 3. The untrained panellists were keen on the salak energy bar developed, compared to those without salak (control energy bar). Several untrained panellists described the acidities that appeared in the salak energy bar and suggested that the typical flavour of energy bars could be reduced. The favourability tests on the untrained panellists suggested an indicator of acceptability on the developed energy bars. According to Tiwari *et al*. (2017), the preference test on untrained panellists can indicate their acceptance of the designed energy bar. Dried Salak provides energy with a more fibrous and tastier bar texture. The addition of dry salak can increase the dominance of the dry salak flavour on the energy bar. According to Rawat *et al*. (2015), the modification of energy bars with high-fibrous and low-fat starch gives a more complex texture, chewy and healthy even though requiring a lot of time to chew the bar. Heating could also improve the bar's flavour, appearance, aroma and textures (Bhakha *et al.,* 2019).

Table 3. The assessment of favourability of the salak energy bar by the untrained panellists.

Sample	Taste	Aroma	Texture	Colour	Overall
CEB	6.33	6.13	6	7.2	6.42
EBS1	7.33	7.43	6.33	7.2	7.07
EBS2	7.5	7.5	6.96	7.5	7.36
EBS3	7.73	7.5	7.5	7.5	7.55

To develop a new product, the public acceptance of the product would ease the process of promotion and marketing. Many efficient and economical products that are acceptable to the public, have high nutritional value and are healthy. For this reason, acceptance of this product determines the sustainability of product use.

4. Conclusion

The energy bar formula consisting of purple sweet potato flour and tapioca flour was modified by adding dried Sidempuan salak and reducing purple sweet potato flour. The addition of dried Sidempuan salak lowers the calorific value of the energy bar due to the decrease in fat content, but the carbohydrate content increases. Energy bar with the formulation of 200 g dried Sidempuan salak fruits, 50 g sweet potato flour, and 50 g tapioca flour is the most preferred energy bar by consumers and has the highest carbohydrate content.

https://doi.org/10.26656/fr.2017.8(3).109

Conflict of interest

The authors declare no conflict of interest that could have appeared to influence the work reported in this paper.

Acknowledgements

This research was funded by the Directorate General of Research Strengthening and Development, Ministry of Research, Technology and Higher Education Republic of Indonesia through the "Penelitian Disertasi Doktor" 2021 scheme.

References

Akesowan, A., Choonhahirun, A. and Jariyawaranugoon, U. (2019). Quality and sensory profile evaluation of gluten-free sapodilla-wild almond seed bar with stevia as partial sugar substitution. *Food Research,* 4 (4), 1109-1115. https://doi.org/10.26656/fr.2017.4(4).421

Aljaloud, S., Colleran, H.L. and Ibrahim, S.A. (2020). Nutritional Value of Date Fruits and Potential Use in Nutritional Bars for Athletes. *Food and Nutrition Sciences,* 11(6), 63–80. https://doi.org/10.4236/fns.2020.116034

Bhakha, T., Ramasawmy, B., Toorabally, Z. and Neetoo, H. (2019). Development, characterization and shelf-life testing of a novel pulse-based snack bar. *AIMS Agriculture and Food*, 4(3), 756–777. https://doi.org/10.3934/agrfood.2019.3.756

Chitraka, M., Kohli, R., Sandhu, I.S., Singh, D. and Sindhu, R.K. (2017). Development and Nutritional, Organoleptic, Biochemical Analysis Development and Nutritional, Organoleptic, Biochemical Analysis of Polyherbal (Stevia, Banana, Cocoa Butter, Oats) Energy Bar. *Journal of Advances in Food Science and Technology,* 4(2), 2–3.

da Silva, E.P., Siqueira, H.H., Damiani, C., Boas, V. and de Barros, E.V. (2016). Physicochemical and sensory characteristics of snack bars added of jerivá flour (*Syagrus romanzoffiana*). *Food Science Technology,* 36(3), 421–425. https://doi.org/10.1590/1678-457X.08115

da Silva, E.P., Siqueira, H.H., do Lago, R.C., Rosell, C.M. and Boas, V. and de Barros, E.V. (2014). Developing fruit-based nutritious snack bars. *Journal Science Food Agriculture,* 94(1), 52–56. https://doi.org/10.1002/jsfa.6282

Fendiyanto, M.H., Satrio, R.D. and Darmadi, D. (2020). Metabolic profiling and pathway analysis in red arillus of salacca sumatrana demonstrate significant pyruvate, sulfur, and fatty acid metabolisms. *Biodiversitas,* 21(9), 4361–4368. https://doi.org/10.13057/biodiv/d210955

Jetavat, K.J., Patel, A.M. and Balakrishnan, S. (2020). Sensory, Physico-Chemical, Textural and Microbial Changes in Milk Protein Concentrate and Cereal Based Energy Bar during Storage. *International Journal Current Microbiology and Applied Science,* 9(7), 697–707. https://doi.org/10.20546/ijcmas.2020.907.080

Kaur, R., Ahluwalia, P., Sachdev, P.A. and Kaur, A. (2018). Development of gluten-free cereal bar for gluten intolerant population by using quinoa as major ingredient. *Journal of Food Science Technology,* 55(9), 3584-3591. https://doi.org/10.1007/s13197-018-3284-x

Munir, M., Nadeem, M., Qureshi, T.M. and Qayyum A. (2018). Addition of Oat Enhanced the Physico-Chemical, Nutritional and Sensory Qualities of Date Fruit Based Snack Bars. *Journal of Food and Nutrition Research,* 6(4), 271–276.

Prazeres, I.C. Dos, Carvalho, A.V., Domingues, A.F.N. and Abreu, L.F. (2020). Preparing multicomponent snack bars based on tapioca flour, Brazil nut, and regional fruits. *Revista Chilena Nutricion,* 47(2), 190–199. https://doi.org/10.4067/S0717-75182020000200190

Rafiu, A., Hassan, C.Z. Arifin, N. and Asma, R. (2015). Physicochemical analysis of high fibre cereal bar formulated with glutinous rice flakes and Ssnnah foods. *Journal of Advances in Food Science and Technology,* 2(2), 47–58.

Rawat, N. and Darappa, I. (2015). Effect of ingredients on rheological, nutritional and quality characteristics of fibre and protein enriched baked energy bars. *Journal of Food Science and Technology*, 52(5), 3006–3013. https://doi.org/10.1007/s13197-014-1367-x

Rehman, W.U., Shah, U., Rabi, K., Munir, M., Saleeem, A., Iqbal, A., Shah, F., Shah, S., Khan, Z.U., Hamayun, M., Hussan A., Gul, H., Rauf, M. and Wang, L. (2020). Development fiber enriched date bars from natural resources. *Fresenius Environmental Bulletin,* 29(7), 6126–6133.

Ritonga, E.N., Satria, B. and Gustian, G. (2018). Analysis of Phenotypic Variability and Correlation on Sugar Content Contributing Phenotypes of Salak (*Salacca sumatrana Reinw* var. Sidempuan) under Various Altitudes. *International Journal of Environment, Agriculture and Biotechnology*, 3(6), 2103–2109. https://doi.org/10.22161/ijeab/3.6.18

Saleh, M.S.M., Siddiqui, M.J., Mediani, A., Ismail, N.H., Ahmed, Q.U. and So'ad, S.Z.M. (2018). *Salacca zalacca*: A short review of the palm botany, pharmacological uses and phytochemistry. *Asian Pacific Journal Tropical Medicine,* 11(12), 645–652. https://doi.org/10.4103/1995-7645.248321

Standard Nasional Indonesia. (1992). Food and Procedure to Test Food and Drink (SNI 01-2891-1992). Indonesia: Standard Nasional Indonesia [In Bahasa Indonesia]

Tiwari, P., Agrahari, K., Jaiswal, M. and Singh, A. (2017). Standardization and development of different types of energy bars. *International Journal of Home Science,* 3(1), 370–372. www.homesciencejournal.com

Torres, E.R., Santana, E., Felix, R., Santana, D. and Cordeiro, J. (2011). Cereal Bar Development Using Exotic Fruit, presented at the 11th International Congress on Engineering and Food. Athens, Greece.

Welli, Y., Agnes, M., Yudi P. and Yustinus, M. (2020). The effect of mixture of banana pseudostem flour proportion on organoleptic. *Food Research,* 4(3), 906–916. https://doi.org/10.26656/fr.2017.4(3).382

Wicaksono, L.A., Karti, E., Susiloningsih, B. and Susanti, M.A. (2019). Proximate Analysis of Food Bar Made from Pedada Fruit (*Sonneratia caseolaris*) Enhanced with Gembili Flour and Mung Bean Flour as an Alternative to Emergency Food, presented at the International Joint Conference on Science and Technology, 17-19th October. Surabaya, Indonesia.

