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The nutrient quality of edamame (*Glycine max* L. Merill) waste as a potential local feedstuff with using the different drying processes

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Abstract. This study purposed to evaluate the effect of both different drying processes on the nutrient content of edamame waste (*Glycine max* L. Merill). The level treatment of the drying process was divided into sun drying or control (P0) and oven drying at 70^{o}C (P1). Every single level treatment has been dried for 48 hours. The variables observed were DM, CP, EE, and CF content of edamame waste. The results presented that the drying process had no significant effect on DM, CP, EE, and CF content of edamame waste by both sun drying and oven drying at 70^{o}C. These results concluded that both drying process of edamame waste were very applicable for smallholder farmers and livestock industries. Smallholder farmers can apply sun drying processes for drying and preserving edamame waste without worrying about nutritional damage and used during times of famine, especially which were in tropical region. Additionally, livestock industries can exploit the nutritional value of edamame waste using thermal processing up to 70^{o}C by example through oven drying.

1. Introduction

The livestock business continues to grow rapidly. It represents a positive impact on economic development that increases farmer's income in meeting the requirement of animal protein. In line with this, it needs to notice to important factors of livestock business sustainability, especially the availability of raw feedstuff materials. Most of the raw feedstuff materials supply still depends on imports, such as yellow corn, fish meal, soybean meal and others. the price fluctuations of raw feedstuff materials occurring due to our dependence on its importations. The availability of insufficient feedstuff will determine the slow growth of the population and production of livestock business. The increasing livestock population and production (meat, eggs, and milk) as a result of the livestock business is highly dependent on the provision of good and quality feedstuff. In addition, feed costs reach the highest percentage in production costs which around 65% to 70% in livestock business.

The one of solving problem is to be overcome nationally by procuring alternative feedstuff materials. Diversification of feedstuff materials based on local resources by utilizing abundant agricultural waste has considerable potential. It is an effort to procure alternative feedstuff materials in

meeting its necessity for increasing the population and production of livestock business. However, it is necessary to do a touch of technology for the feed manufacture based on local resources.

The edamame is a mainstay product, especially in the Jember Regency, East Java Province, Indonesia. The presence of edamame makes Jember has a superior commodity that is recognized worldwide, in line with other leading commodities such as tobacco and cocoa [1]. The production of edamame waste was currently developed as an alternative feedstuff [2,3] for implementing zero waste principle [4], especially in the Jember region [5]. The development of edamame waste utilizing was still being enforced in order to obtain the best texture and composition for supporting the growth and development of livestock [5]. The feed consumed by livestock was the one of factors that determine the good or poor of livestock growth.

A study by Kustiawan et al had shown that the administration of edamame waste with the additive usage of exogenous enzymes up to 0.28% w/w has the potential to increase nutrient consumption and the liveweight gain of weaned local sheep [2]. It showed that edamame waste is the one of potential alternative raw feedstuff materials and has good prospects for livestock. Therefore, this study purposed to evaluate the effect of both different drying process on the nutrient content of edamame waste (*Glycine max* L. Merill).

2. Methods

The edamame waste (*Glycine max* L. Merill) as a research material was obtained from PT. Mitratani Dua Tujuh Jember Regency, East Java Province. It was dried based on both treatment which were:

P0 = sun drying or control
P1 = oven drying of 70^{o}C

Both of drying processes were undertaken for 48 hours each. This study consisted of two levels treatment and each treatment consisted of three replications. Sun drying and oven drying processes were enforced at the surrounding of Teaching Factory of Mini Feed Mill and implemented at the Laboratory of Plant, respectively. Both places were in the Politeknik Negeri Jember. After samples dried, they were finely ground into powder for determining their nutritional values through proximate analysis at the Laboratory of Feed Science and Technology, IPB University. The proximate analysis of crude protein (CP), ether extract (EE), and crude fiber (CF) used AOAC method [6]. The parameter observed the nutritional values of edamame waste which were consisted of DM, CP, EE, and CF. Data were analyzed by Independent Samples T-test using PASW Statistical 18.

3. Results and Discussion

Sun drying was the most economical and applicable drying process for smallholder farmers however the use of an artificial dryer or oven provided a better product [7]. Table 1. presents that edamame waste dried under the sun and by oven with temperature of 70^{o}C which were no significant effect (P>0.05) on the quality of nutrient content such as dry matter, crude protein, ether extract, and crude fiber.

Table 1. The average of nutrient content on edamame waste by sun drying and oven drying at temperature 70 ^{o}C for 48 hours each

Treatment	Dry Matter (%)	Crude Protein (%)	Ether Extract (%)	Crude Fiber (%)
P0	23.69 ^{ns}	27.23 ^{ns}	11.89 ^{ns}	18.16 ^{ns}
P1	23.77 ^{ns}	26.98 ^{ns}	11.78 ^{ns}	18.19 ^{ns}

Note: ns = non-significant

The dry matter of edamame waste at different drying process during 48 hours were ranged 23.69% to 23.77%. It indicated that the water content on sun drying and oven drying at the temperature of 70^{o}C meet the standards of SNI 01-2721-1992. ie a maximum of 40%. The temperature of the material during drying process was not only influenced by the initial and final moisture content of material, but the air-drying temperature would greatly affect the material temperature. The drying process would be slow down when the drying temperature was lower.

The results of proximate analysis presented that sun drying treatment (P0) and oven drying by temperature 70°C (P1) during 48 hours each, did not affect the content of crude protein, ether extract, and crude fiber of edamame waste. The crude protein content of edamame waste ranged from 26.98% to 27.23%. The protein content of edamame waste had exceeded the minimum protein standard for fattening cattle by the National Standards Agency which was 13% [8].

The ether extract content ranged 18.16% to 18.19%. Similar number of ether extract content followed its water content. It showed that the drying process of edamame waste for 48 hours under the sunlight or by oven drying with temperature of 70°C did not affect the nutrients quality between levels treatment. This was in line with the research report of [9] which stated that the increasing of lipid content by high temperature drying due to a decreasing of water content so that the percentage of lipid content increased. The crude fiber content in edamame waste ranged 11.78% to 11.89%. The fiber content of edamame waste was equivalent with the fiber content of banana peel waste as much as 11.81% [10].

4. Conclusions

In accordance with the results, it concluded that both drying processes through sun drying and oven drying at temperature of 70°C for 48 hours each had no effect on the nutritional values of edamame waste. These both drying processes of edamame waste were very applicable for smallholder farmers and livestock industries. Smallholder farmers can apply sun drying processes, especially which were in the tropical region, for drying and preserving edamame waste without worrying about the nutritional damage and used during times of famine. Additionally, livestock industries can exploit the nutritional value of edamame waste using thermal processing up to 70°C, by example through oven drying.

5. Acknowledgment

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