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ScienceDirect

Procedia Food Science 3 (2015) 355 – 363

Procedia Food Science

The First International Symposium on Food and Agro-biodiversity (ISFA2014)

Selection of soybean genotypes by seed size and its prospects for industrial raw material in Indonesia

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Abstract

The main utilization of soybean with large seed size in Indonesia is for industrial (tempeh) raw material. The aim of this research was to select soybean genotypes based on seed size and yield. Experiment was conducted at Jambegede Research Station (Malang), from March until June 2014 using 150 soybean genotypes. The selection revealed the existence of variability among genotypes. A simultaneously selection successfully obtained eight genotypes with yield >2.53 t/ha and seed size > 15.8 g/100 seeds. These selected genotypes prospective for source of tempeh material and need to examine its yield recovery, nutrition (protein) and sensory characteristic.

Peer-review under responsibility of the organizing committee of Indonesian Food Technologist Community

Keywords: soybean; selection; high yield; large seed size; tempeh

Introduction

Soybean is an important commodity in Indonesia. From the total supply of soybeans in Indonesia, both imported and domestic, 70% is for tofu and tempeh and 30% for other food needs [1]. Tempe is essential menu in the daily consumption of most Indonesian society,

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Peer-review under responsibility of the organizing committee of Indonesian Food Technologist Community
doi:10.1016/j.profoo.2015.01.039

especially as a source inexpensive protein. Large seeded soybean are widely used as raw material for tempeh.

Since 1918, Indonesian Agency for Agricultural Research and Development (IAARD) have released 78 soybean improved varieties, and several of them have large seed size (14-17g/100 seeds). The large seed size soybean varieties (e.g. Anjasmoro, Burangrang, Bromo, Argomulyo, and Grobogan) were similar with imported soybeans with an average weight of 16 g/100 seeds and showed similar quality of tempeh (color, aroma, texture, taste) with higher protein content and yield recovery than imported soybean [2,3]. Krisdiana [4] reported that about 93% of tempeh producers preferred large seeded soybean (especially imported soybean) and yellow seed coat because it will produce tempeh with bright colors and large volume. This is reasonable, because according a research by Antarlina et al. [5] concluded that soybean seed size is a factor determinant of the quality of tempeh because positively correlated with weight (r = 0.86 **) and tempeh volume (r = 0.95 **).

Seed-size traits are controlled by multiple genes in soybean, and play an important role in determining seed yield, quality and appearance [6]. Although maximum seed size may be under genetic control, but seed size was determined by environment in the seed filling period [7]. Mathew et al. [8] added that seed size can still be modified by the environment with some internal control moderating the final size of most seeds in all pods.

The opportunity to obtain soybean variety with large seed size is very possible, due to the seed size was determined by the rate of seed growth and duration of dry weight accumulation in seed fraction, which both were genetically controlled and inherited [9,10,11]. A research by Krisnawati [12] had successfully obtained soybean large seed size delivered from crossing using a large seed size parental (>14 g/100 seeds). Cober et al. [13] estimated the heritability for seed size, obtaining moderate to high values 19-56% for seed size, and concluded that an early generation selection was effective due to the high heritability of this trait.

To meet the needs of soybeans, the essential efforts to increase domestic production are through the use of high yielding varieties and appropriate quality seeds. Perry [14] reported that there is a close correlation between seed size and seed nutritional resources, therefore it is expected that an increase in seed size has a positive role in seedling growth and subsequently increasing the seed yield. In favorable germination and growth condition, large seeds will produce larger seedling in compare with small seeds and it can cause to increase the crop