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Spudy Agrihorti Is A High Yielding Potato Variety Suitable For Chipping Industry

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Abstract.

The demand for potato in the domestic chips industry is very high and most of it is still imported. Small and medium industries that process chips generally find it difficult to get raw materials because they are unable to import while domestic raw materials are almost unavailable. Therefore a breakthrough is needed to get new superior varieties of processed potato chips that are suitable for industrial raw materials both large, medium and small industries. The purpose of this study was to obtain a candidate for a new superior variety of processed potato chips. The output of this activity is to get at least one potential potato variety suitable for the raw material for the domestic chip industry. The study was conducted in Cikandang Village, Cikajang District (1300 m asl), Garut Regency. The experimental design used Randomized Complete Block Design (RCBD), the number of replications was 4 times, the treatment consisted of six genotypes namely Spudy Agrihorti, clones 12.20, clones 14.5.1 and three comparative varieties namely Atlantic, Medians, and Granola. Plant population 80 plants / plot. Observations were made on the qualitative character, quantitative character, chemical analysis of potato and consumer preferences. The results showed that Spudi Agrohorti was the variety that has the highest yield reaching 40.8 tons/ha compared to other varieties. Spudy Agrihorty also displays supporting data of a highly qualified processed quality to be used as raw material for the chips industry. This is indicated by the high carbohydrate content of 14.77%, a high specific gravity of 1.093 m3 with very low reducing sugar content of 0.03%. The quality results of Spudy agrihorti chips are preferred by consumer respondents because they have a yellow chip color compared to white chips produced from chipping varieties of Atlantic and Medians.

Keywords: chip industry, consumer preference, high-yield variety, potato chips, spudy agrihorti

1. Introduction

Large industries that process potato chips in Indonesia are still very rare and all of them use imported raw materials. The variety used for the processed chip industry is Atlantic which is imported from Canada, Australia, and Scotland. The Atlantic variety is suitable as a raw material for potato chips, because it tastes good, with a high SG (specific gravity) characteristic of 1.078 – 1.087 (Basuki et al. 2005), thus giving a high yield of chips. However, according to growers, the varieties are less favored,

because yields are lower than Granola, very susceptible to late blight (Phytophthora infestans), susceptible bacterial wilt (Ralstonia solanacearum) and the degeneration period is very fast (Kusmana and Basuki, 2004).

Efforts to obtain the genotype of processed potato chips have been carried out since 2004 at the Vegetable Crops Research Institute (IVEGRI) through a cross method by using one of the parents of Atlantic processed potato varieties with a collection of germplasm of IVEGRI potatoes (Kusmana and Sofiari, 2007; Kusmana, 2012). Crosses with target resistance to Late blight (P.infestans) and high carbohydrate content produce 21 combinations of cross yields (Handayani et al., 2015). Breeding stages carried out on potato plants include early generation selection at the tuber family stage, selection of plant architecture, tuber shape selection, tuber skin selection, tuber depth selection, and plant uniformity, then evaluating the yield and quality of Sg tubers, starch, sugar content (Brown and Dale, 1998; Love et al., 1997). Spudy Agrihorti is the result of a cross between variety of Atlantic and Repita's. Spudy Agrihorti is very adaptive to be cultivated in the potato production center in Garut Regency, West Java.

2. Material and Methods

2. 1 Planting Material

Total potato genotypes planting was six they were Spudy Agrihorti, Clone PB 12.8, Clone 14.5.1 and three comparative varieties of Atlantic, Granola and Medians.

2. 2 Location and Time

The research was carried out at the Agricultural Technology Park, located in Cikandang Village, Cikajang District, Garut Regency, West Java Province (1300 m asl). The research was held from September 2017 to January 2018

2. 3 Method

The research was arranged using a Randomized Complete Block Design (RCBD) with a total of 4 replications. Out of 80 plant populations/plots, 11 plants were randomly sampled. Plants are planted using beds covered with black plastic mulch, according to local farmers' habits when growing industrial potatoes. Plot size 1.2 m wide and 14 m length, with a plant spacing of 60 x 35 cm (double row). Plant population / plot of 80 plants.

One week before closing the plastic mulch was given 20 tons of chicken manure, 500 kg of NPK 16:16:16 and 40 kg of nematicide for each hectare. The maintenance of the plants including irrigation, NPK supplementary fertilizer application at the age of 30 days after planting was as much as 500 kg / ha. Pest and disease pest control was carried out twice a week. The chemicals used for disease pests was the Mancozeb type while for pest pests of the Prefenofos type the dosage was used in accordance with the manufacturer's recommendations.

This study observed both following qualitative and quantitative characters: 1) Plant height is measured from the ground level to the highest part of the plant, when the plant is 70 by using a ruler; 2) The yield of tubers / plants is calculated from a total of 11 sample plants; 3) The number of sweet potatoes per plant is calculated from the number of samples / plots of 11 random sample plants: 4) Tuber yield / plot is weighed from the tuber weight produced/plot; 5) Tuber weight / ha is calculated by

weighing the tuber / plot and then converted to hectares with 80% land efficiency; 6) Quality of tubers such as, specific gravity, reducing sugars and carbohydrates were observed at the post-harvest laboratory services. Qualitative data observed included: leaf color, leaf shape, flower corolla color, tuber skin color, tuber flesh color and taste (observed at harvest and after harvest). Observation of colors using the RHS (Royal Horticulture Society) color chart. Quantitative data not analyzed statistically is also carried out on consumer preferences through questionnaire from 30 respondences. Score is 1–5, where 1 = not liked; 2 = rather like; 3 = preferred; 4 = preferred; 5 = very liked.

2. 4 Data Analysis

Quantitative data were analyzed using statistic computer of PKBT STAT 2.01 software.

3. Result and Discussion

3. 1. Qualitative Observations

Observation of morphological characteristics of plants and tubers is intended to compile a description of the variety in addition to getting a special identifier of the variety. In general, the overall leaf shape of six genotypes is oval, whereas leaf colors of all genotypes, which are almost the same, namely green 137 A and 137B Green Group RHS.

The flower corolla of the Spudy Agrihort is white (155C White Group RHS), while Atlantic and Medians was purple (84B Violet Group RHS) (Figure 2). The flower corolla is a unique character because it is different from the comparative varieties of Atlantic and Medians. Spudy Agrihorti has a pale yellow flesh color (163C Greyed Orange Group RHS) which is different from the comparative varieties of Atlantic and Medians which are white (155B and 155 A RHS White Group). The tuber shape of all genotypes were oval (Figure 3).

Fig.1. Leaf shape. (a) Clone PB 12.20, (b) Spudi Agrihorti, (c) Clone 14.5.1, (d) Atlantic, (e) Medians, (f) Granola.

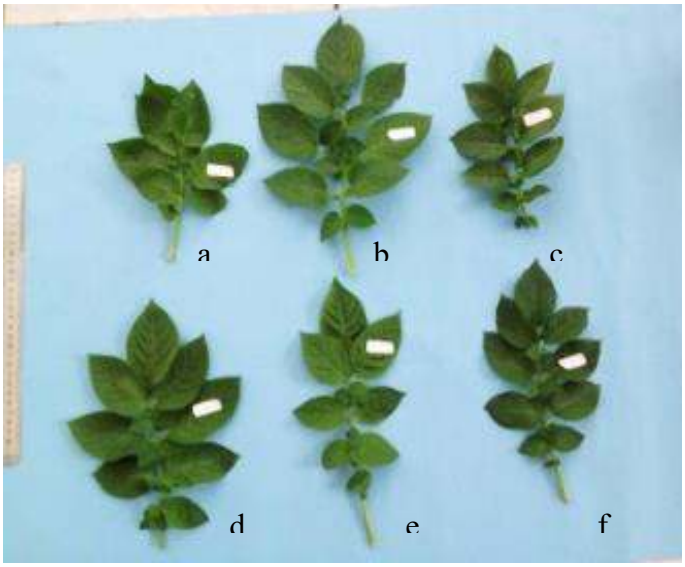


Fig. 2. Inflorescence. (a) Clone 14.5.1, (b) Spudy Agrihorti, (c) Atlantic, (d) Medians

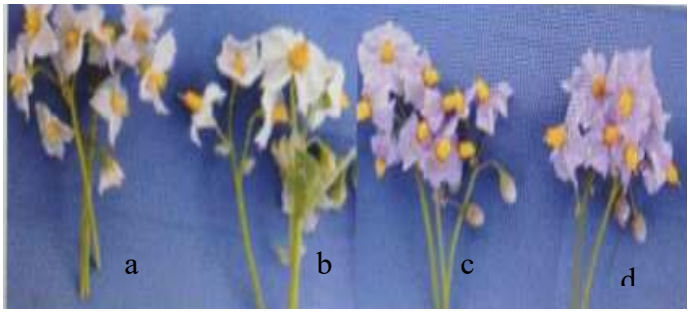
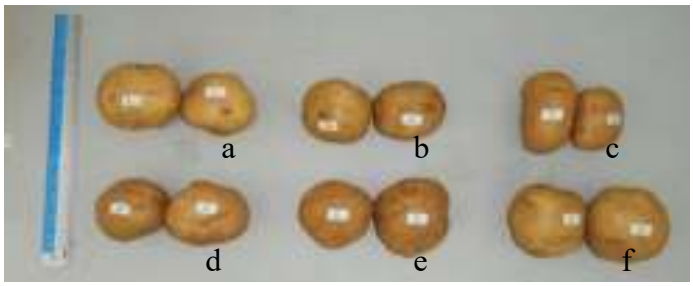


Fig.3. Tuber shape. : (a) Clone PB 12.20, (b) Spudi Agrihorti, (c) Clone 14.5.1, (d) Atlantic, (e) Medians, (f) Granola.



The yellow tuber flesh is the favored color of consumers both of vegetable potatoes and processed potato chips. Tuber skin characteristics, almost all genotypes display light yellow skin color, except for Granola varieties with slightly different tuber skin color is pale yellow (163C Greyed Orange Group RHS).

Table 1.Chemical composition of six potato genotipes

Genotypes	Starch (%)	Reduction sugar (%)	Specific gravity (M3)
PB.12.20.	15.69	0.34	1.069
Spudy Agrihorti	14.77	0.03	1.083
Klon 14.5.1	9.60	0.21	1.076
Atlantic	10.97	0.05	1.078
Medians	12.22	0.03	1.080
Granola	10.85	0.12	1.067

Observation of potato chips based on three main characters e.g. taste, crispness and color of chips. Spudy Agrihorti showed the level of crispness and taste that equals to processing potato variety of Atlantic. Even the yellow Spudy agrihorti chips were preferred by consumers over Atlantic and Median varieties. Total reduction sugar which tolerant for processing potato is 0,28 – 0,50% (Kumar et al., 2004). The use of raw materials with high Spesific gravity (Sg), has an impact on the efficiency because it gives a high value of chips and is more efficient in the use of cooking oil. Spudy Agrihorti showed the most superior quality attributes of raw materials, namely high carbohydrate content, low reducing sugar and the highest Sg compared to other genotipes (Table 1). In the United State chips industries preferred round white flesh cultivars with high Sg more than 1.076 and scored frying 2.5 (Douches, et al, 1996). In China potato can be processed to several products such as strach, noodle, french fries, chips and dehydrate potato (Jansky, et al, 2009).

Table 2.Consumers preferences for taste, crispiness, colour of 6 potato chips

Genotypes	Taste	Crispiness	Colour
PB.12.20.	3,42	3,92	3,92
Spudy Agrihorti	3,95	4,00	4,25
Klon 14.5.1	3,42	3,08	2,75
Atlantic	3,98	4,08	3,95
Medians	3,92	3,98	3,50
Granola	3,83	2,92	2,75

Score 1= not like; 3 = like; 5 = very like

3. 2. Quantitative Characters

Spudy Agrihorti performed as the tallest plants and more vigorous even though it was not significantly different from the comparative varieties of Atlantic, Granola and Medians. The number of tubers produced by the Spudy Agrihorti is very high > 20 tubers / plants equal to Clone 14.5.1 and very significantly different from the three comparison varieties (Table 3). The large number of tubers per plant makes it easy for farmers to get seeds in the following season. Besides the high number of tubers, the tuber yield of Spudy Agrihorti is also very high, reaching 1,314 kg / plant which is significantly higher than the comparative varieties of Atlantic and Granola. Likewise productivity per hectare of Spudy Agrihorti ranks at the top of 31.44 tons / ha significantly higher than processed potato of Atlantic varieties which are only 18.46 tons / ha (Table 3). High yields obtained of Spudy Agrihorti variety as a result of the heterosis effect, which are derived from the results of a cross between Atlantic and Repita that have a considerable long genetic distance (Kristianto, *et al*, 2019)

Tuber bulking of potato crop is strongly influenced by the occurrence of carbohydrate and metabolism resulting from synthetic starch and sucrose translocation from leaf to stolon and tuber induction from leaf to stolon is influenced by the balance between the stimulus element tuberization and the inhibitor tuberization element (Fischer *et al*, 2008). The tuber yield in potato plants is controlled by genes that work additively and its expression is strongly influenced by the environment (Brown, 1985).

Table 3.Plant height, tuber number and tuber yield six potato genotipes for processing

Geno types	Plant height (cm)	Tuber number (#)	Tuber yield/plant (g)	Tuber yield/plot (kg)	Tuber yield ton/ha (ton)
PB.12.20.	72.4 b	14.25 b	821b	35.25bc	20.77b
Spudy Agrihorti	91.87a	20,50 a	1,314a	53.25a	31.44a
Klon 14.5.1	74.13ab	22.5a	865b	43.50abc	25.52ab
Atlantic	81.27ab	6.00b	955b	31.50c	18.46b
Medians	82.47ab	10.25 b	1,049 ab	50.75ab	28.40ab
Granola	79.33ab	8.75b	869b	46.00abc	26.99ab
CV	8.05	22.95	15.19	17.36	17,93

4. Conclussions

Spudy Agrihorti has a unique characteristic of the white flower corolla and the yellow tuber. It productivity reached 31.44 tons/ha, the highest among other varieties in this research. The chips of Spudy Agrihorti are very popular among consumers because they have great taste, crispy, and good color.

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