DETERMINATION OF OPTIMUM INITIAL BULB WEIGHT OF ONION (*ALLIUM CEPA* L.) USING POLYNOMIAL REGRESSION MODEL

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Introduction

Onion (*Allium cepa*) is a major bulbous crop among vegetables and is of global importance. Out of 15 vegetables listed by FAO, onion falls second only to tomato in terms of total annual world production (Pathak, 2000). Onion bulb is rich in minerals, especially calcium and phosphorus besides having fairly good quantities of carbohydrates, proteins and vitamin-C. It forms an indispensable part of many diets of both vegetarian and non-vegetarian as a flavouring agent. It is consumed in raw form and salads regularly in small quantities comparable with that of hot pepper. The pungency in onion is due to a volatile compound known as allylpropyl disulphide, which is sulphur rich compound. It has got the effects of lowering the blood sugar and also having good coagulation effect. The good storage of dry onion has facilitated the world wide trade and is always in demand even in the smallest local markets. Low productivity of onion in Sri Lanka could be attributed to limited availability of quality seed and lack of appropriate hybrids. To minimize the cultivation and production problems, emphasis must be given to improve cultivation methods of onion, such as proper planting geometry, optimum mother bulb size and planting time, accurate fertilization and other cultural practices viz., weeding and mulching. Mother bulb size has also a pronounced effect on growth and yield of onion. Karim *et al.,* (1999) observed the best yield of onion could be achieved with large size mother bulb (20 g). The present investigation was, therefore, undertaken to find out the optimum size of mother bulb needed to achieve the best growth of onion under the existing agro-climatic conditions of Batticaloa.

Methodology

A pot experiment was conducted from August – November, 2011 at the Agronomy Farm, Eastern University, Chenkalady, Batticaloa, located in low country dry zone of Sri Lanka. The onion variety Vethalan was used for the experiment. Initial bulb weights of onion was measured and planted at the recommended spacing 10cm X 10cm (Department of Agriculture, 1989) into rectangular shaped pots (1470 cm^2 surface area) filled with non calcic brown soil and compost mixture in a ratio of 2:1 by volume. All the agronomic practices were performed as per current crop recommendations of the Department of Agriculture (1989). Bulb weight of onion plants was recorded at physiological maturity.

The polynomial type of production function was used (Sharma *et.al.,* 1989) to determine the optimum initial bulb weight for maximum bulb weight / plant at harvest using the equation,

$$Y = b_1 + b_2X + b_3X^2 + e$$

Y = depended variable; X = independed variable; e = error term; $b_1 > 0$; $b_2 > 0$ and $b_3 < 0$ where b_1 is the intercept, b_2 is the slope of curve and b_3 is the curvature of the curve. The optimum initial bulb weight was determined as follows:

Discussion and Conclusion

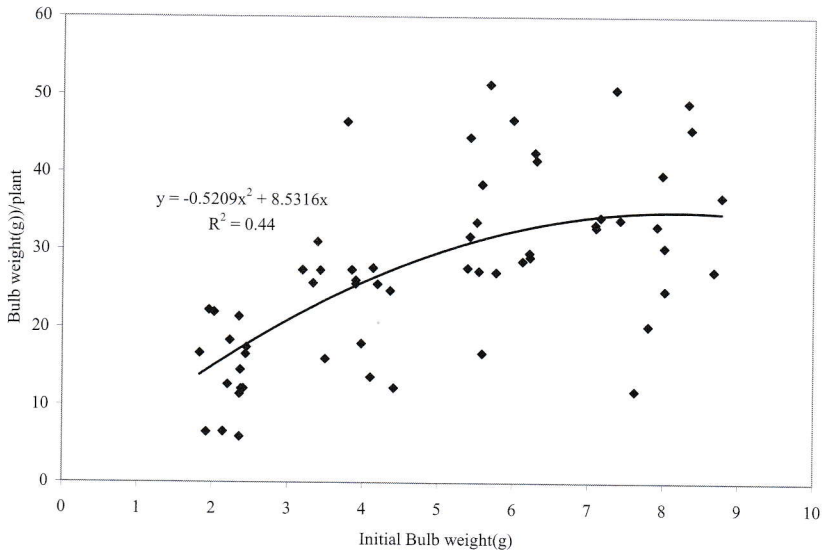

Figure 1. Relationship between initial bulb weight and bulb weight (g)/ plant of onion at harvest

$$\frac{dY}{dX} = b_2 + 2b_3 X = 0$$

Significant ($p<0.05$) relationship was observed between initial bulb weight and bulb weight / plant of onion at harvest. The response of bulb weight per plant at harvest to initial bulb weight at planting described by the equation $y = -0.5209x^2 + 8.531x$. As shown in Figure 1, the maximum bulb weight of onion per plant at harvest was recorded at the initial bulb weight of 8.20g. This was obtained by equalizing the first derivative of the curve to zero (Figure 1 and Equation 1).

$y = -0.5209x^2 + 8.531x$ .....Equation (1)

When y is maximum,

$0 = dy/dx = -1.04\ x + 8.53$

$x = 8.20(g)$

Where y = bulb weight (g)/ plant at harvest, x = initial bulb weight (g)

Bulb weight / plant at harvest markedly increased as initial bulb weight increased up to 8.20g. Further increases in initial bulb weight reduced bulb weight / plant at harvest. This confirmed the findings of Nourai *et al.*, (2003) who reported that large amount of food reserves stored in large bulbs which enhanced the production of healthy and vigorously growing plants. Increase in initial bulb weight from 8.20g reduced bulb weight / plant at harvest. Similar results were reported by Singh *et. al.* (1990) and Perez *et. al.*, (1996).

The overall results obtained from this study revealed that optimum initial bulb weight for bulb weight / plant at harvest was 8.20g. Therefore, it can be concluded that, size of the bulb used for planting is very important in the selection of planting materials in order to obtain maximum onion bulb production.

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