

## Effect of Forward Speed and Tuber Characteristics on Tuber Spacing Uniformity for a Cup-Belt Potato Planter

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**Abstract:** The present study has been conducted to evaluate the performance of an auto-feed cup-belt potato planter operated at three forward speeds (1.8, 2.25 and 3 km/h) and three tuber sizes (35-45, 45-55 and 55-65 mm). Also, Hermes and Sponta varieties were utilized to provide different tuber shapes (spherical and oblong, respectively). The performance of the planter was evaluated in terms of the mean tuber spacing (M), the coefficient of variation (CV), the multiple index (MULTI), the miss index (MISI) and the quality of feed index (QFI). The results revealed that the increase in the forward speed induced a significant increase in the mean tuber spacing and a significant reduction in the tuber spacing uniformity, as indicated by the values of the CV, MULTI and MISI indexes. Also, tuber size was observed to induce insignificant effects on the mean tuber spacing. But, the effect of tuber size on tuber spacing uniformity was found to be significant. Tuber size of 35-45 mm induced better tuber spacing uniformity than other tested tuber sizes. On the other hand, tuber shape (variety) exhibited significant effects on both the mean tuber spacing and tuber spacing uniformity.

**Key words:** Potato planter • Planter performance • Tuber size • Tuber shape

### INTRODUCTION

Potato is ranked as one of the most important vegetable crops in the world. Potato occupies the second place in importance after seed crops [1]. In Saudi Arabia, potato crop is planted in an area of 17,665 hectares in season 2010 with a production of about 444,138 tons [2]. Potato planting is considered as a very crucial and critical operation because it directly affects the yield and the farming cost, as the price of potato tubers mounts to about 60% of the total potato production cost [3]. Improving uniformity of within row spacing is expected to decrease competition between plants and increase grain yield through more efficient use of available light, water and nutrients by the plants. The performance of several potato planters has been investigated by many researches and studies: Bader [4] evaluated three potato feeding systems (semi automatic chain, semi automatic tray and automatic cup) to determine the optimum

operational requirements and to select the most effective system. Automatic cup planter was found to be the best. Wahby *et al.* [5] observed lower in-row spacing with cup-feeding planter than semi-automatic and finger-feed mechanism planters. However, Ghonimy and Rostom [3] observed higher coefficient of variation for tuber spacing with auto-feed cup planter than planters with either single- or multi-feed belts. Previous studies showed that there is a correlation between speed and performance of potato planters where the low performance of these machines may be due to the high of forward speed [6]. Altuntas [7] reported that seed distribution pattern in the row was disturbed as forward speed increased. Forward speed and release point on the metering mechanism was found to affect tuber spacing distribution in the furrow [8]. Khairy [9] reported that as the forward speed increased the mean tuber distance increased. He observed low uniformity when the forward speed was higher than 3.6 km/h. Adjusting planting speed in conjunction with

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