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RESEARCH NOTE

Influence of Planting Date and Planting Distance on Population Density of Onion Armyworm

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Onion is an important crop in the province of Nueva Ecija, Philippines. Currently, its production is being constrained by onion armyworm (OAW; *Spodoptera exigua*). The impact of planting dates and distance on the infestation of OAW was studied across two productions. The aim is to evaluate the influence of different combinations of planting dates (November, December, and January) and row spacing [5 cm x 10 cm, 8 cm x 10 cm, 10 cm x 10 cm, and farmer's practice or *waray* (6–10 cm x 6–10 cm)] on the damage and population density of OAW. The count of observed OAW larvae from the earliest month (November) and during the month of the usual production period (November–December) was negligible to minimal. However, a significant increase in the OAW population during late planting (January). In terms of leaf damage caused by the OAW feeding, November, December, and January planting had an increasing percentage as the OAW population also increased. There was an increase in bulb diameter as the row spacing widens (10 cm x 10 cm), as well as an increase in the number of marketable bulb onions when it is narrow (5 cm x 10 cm). This study showed that planting dates and distances should be one of the major considerations in onion production and insect pest management.

Keywords: onion, planting date, planting distance, *Spodoptera exigua*

Onion is an important bulb crop grown around the world. The crop is cultivated for its green state and mature bulbs for food consumption. However, the high-yield production of onion is being threatened by different insect pests. During the 2018 growing season, the massive infestation of *Spodoptera exigua* (armyworm or *harabas*) in Nueva Ecija has led to the destruction of over 8,378 ha of onion production area in the province (Galang 2018). Nueva Ecija supplies 54% of the Philippines' annual onion production (PSA 2014).

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Simultaneously, the rate of destruction by armyworms from 40-45% results in reducing almost half of the supply. These difficulties initiate the government to import onion bulbs to alleviate supply and prices (Roque 2018).

Planting dates and row spacing, or plant population is crucial in production and are imperative for growth and development; early planting may ace the dry season and offer the longest growth cycle, and late planting may experience high rainfall, which is unnecessary for onion bulb cultivation (Misu *et al.* 2018). Row spacing has a vital role in maximizing growth, bulb yield, and bulb quality (Abou Khadrah *et al.* 2017) while reducing onion armyworm (OAW) larvae. Thus, these factors can be considered in deciding when and how to sow and transplant onion seedlings. Therefore, the study aimed to determine the effect of different planting dates and row spacing on the yield of onion, occurrence, and population density of OAW larvae and damage caused by OAW.

The experimental field area was plowed four times and harrowed twice. Randomized complete block design (RCBD) was followed in setting up the experimental area with four treatments and three replicates (Figure 1). Seedlings variety *Super Pinoy* was raised for 45 d in the seedbeds prepared in Central Luzon State University field experimental station before the scheduled transplanting dates in Santo Domingo, Nueva Ecija.

During Years 1 and 2, the seedlings were transplanted according to different planting dates (November, December, and January) with four different rows spacing between plants such as 5 x 10 cm, 8 x 10 cm, 10 x 10 cm, and farmer's practice or *waray* (6–10 cm x 6–10 cm) with an average plant population per m^2 of 200, 125, 100, and 140, respectively. Cultural management such as irrigation, fertilization, and pest and disease management were based on farmers' practices.

Pest observation begins on the third week after transplanting and if visible damage caused by OAW is noticeable. The time of observation was done early in the morning to ensure the presence of armyworms and to count the population within the onion plant. Four quadrants per treatment were selected and plotted using bamboo sticks with an area of 0.25 m^2 per quadrant. Twenty (20) randomly selected plants per treatment replicate were tagged as sample plants to assess the influence of planting dates and planting distance on the occurrence of OAW.

Harvesting was done 11–12 wk after transplanting. Harvested onion bulbs were sorted into marketable and non-marketable bulbs to gather data on the number of bulbs and their weight in kg. Data were subjected to analysis of variance, RCBD, and means were compared by least significant difference ($p < 0.05$) using STAR (Statistical Tool for Agricultural Research).

The observed armyworm larvae at 06:00–09:00 AM in the morning ranged from 0–2 in November, 0–13 in December, and 0–69 in January per experimental quadrant in both Years 1 and 2 (Table 1). According to Navasero *et al.* (2017), moth migration was observed brought by strong easterly winds during the month of February,

Figure 1. Experimental Area of Onion for November, December, and January planting using four different rows spacing [5 cm x 10 cm, 8 cm x 10 cm, 10 cm x 10 cm, and farmer's practice or *waray* (6–10 cm x 6–10 cm)].

Table 1. Number of onion armyworm larvae and percent leaf damage per plant from 20 sample plants observed from November 2018–January 2019 and November 2019–January 2020 at different growth stages of the crop.

Row spacing (cm)	Number of armyworms						Leaf damage (%)					
	Nov		Dec		Jan		Nov		Dec		Jan	
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2
5 x 10	0	1[ab]	3	3	15[b]	0	0.19	2.44	5.36	4.49	30.41	15.67
8 x 10	0	2[a]	1	5	32[b]	0	0.95	2.64	5.75	3.14	38.15	12.97
10 x 10	0	0[b]	0	2	69[a]	1	1.54	3.33	6.32	4.27	37.57	16.82
Waray (6–10 x 6–10)	0	0[b]	13	1	10[b]	10	1.29	3.18	5.50	3.63	31.33	17.13
Average							1.29	2.90	5.70	3.88	34.37	15.64

[Y1] 1st year/ Year 1; [Y2] 2nd year/ Year 2
Means with the same letter are not significantly different at the 5% level

which may increase the insect population in the field. The OAW is a nocturnal insect pest feeding on bulbs heavily during nighttime (Ueno 2015), which may be one of the contributory factors that can be attributed to the minimal number of armyworms noticed during the daytime. The percent leaf damage across different row spacing ranged from 0.95–3.33% in November, 5.36–6.32% in December, and 12.97–38.15% during the month of January (Table 1). In terms of row spacing, the highest noticeable percent leaf damage was seen in the 10 cm x 10 cm, which has the bigger bulb size of the plant population. Alemu *et al.* (2022) recorded the highest plant height of different onion varieties planted at 10–12 cm distance between plants. However, the effect of higher biomass of onion plants and the effect of different climate types across onion growing areas in the country on the behavior of OAW needs further study. The use of an optimized in-row plant population (Murray *et al.* 2019) in an onion planting bed to avoid possible pest infestation and losses is also recommended. Additionally, with earlier cropping, one can also avoid the adverse infestation of OAW by avoiding the duration in which they have caused the highest infestation, as observed during the month of March and April, wherein the temperature is favorable for their growth and fecundity.

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