

1 EFFECT OF PROPAGULR AND PLANTING PATTERN ON GROWTH AND YIELD OF 2 PINEAPPLE

3

4 Abstract

5 Pineapple (*Ananascomosus* L.) is an economically important tropical fruit crop valued for its
6 nutritional, medicinal, and industrial uses. It contributes significantly to income generation and
7 food security in many tropical regions, including Nigeria. However, productivity is often
8 constrained by inappropriate selection of planting propagules and planting pattern. This study
9 determine the effects of propagule type and planting pattern on vegetative growth, reproductive
10 performance, and fruit yield of pineapple under the agro-ecological conditions of Ogidi Village,
11 Orire Local Government Area, Ogbomoso, Nigeria.

12 The experiment consisted of a factorial combination of three propagule types (suckers, slips, and
13 crowns) and two planting patterns (single-row and double-row). Data were collected on plant
14 height, D-leaf length, number of leaves, days to flowering, days to fruiting, fruit length, fruit
15 diameter, mean fruit weight, crown weight, and fruit yield.

16 Propagule type significantly ($P \leq 0.05$) influenced all measured vegetative and reproductive
17 parameters. Sucker-derived plants consistently exhibited superior vegetative growth, attaining
18 the greatest plant height (118.83 cm), D-leaf length (41.57 cm), D-leaf width (10.90 cm), and
19 leaf number (37.23 leaves) at 14 months after planting. Suckers also produced significantly
20 higher fruit length (19.71 cm), fruit diameter (36.86 cm), mean fruit weight (1.779 kg), and
21 crown weight (327.20 g) compared with slips and crowns. Planting pattern significantly affected
22 most growth and yield traits, with single-row planting generally enhancing plant height and fruit
23 weight, while double-row planting improved certain fruit dimensions. Significant interaction
24 effects indicated that the influence of planting pattern on growth and yield was dependent on
25 propagule type.

26 Fruit yield ranged from 22.36 to 84.71 t ha⁻¹ and was highly significant ($P \leq 0.01$) among
27 treatments. The highest yield was obtained from sucker-based treatments under favorable
28 planting configuration. The findings demonstrate that the use of sucker propagules combined

29 with single row planting optimizes vegetative development, fruit characteristics were
30 recommended for improved pineapple production under the agro-ecological conditions of
31 Ogbomoso, Nigeria.

32 **Keywords:** Pineapple, *Ananascomosus*, propagule type, planting pattern, fruit yield, Ogbomoso.

33 **Introduction**

34 Pineapple (*Ananascomosus* L. Merr.) is a major tropical fruit crop belonging to the family
35 Bromeliaceae and is widely cultivated in humid and sub-humid regions of the world. Globally,
36 pineapple ranks among the most important fruit crops in international trade, contributing
37 substantially to the economies of tropical countries through fresh fruit export and processed
38 products such as juice, canned slices, concentrates, and dried fruit. Leading producers include
39 countries in Latin America, Southeast Asia, and Africa, with global production steadily
40 increasing due to rising consumer demand and improvements in agronomic practices (Food and
41 Agriculture Organization, 2023). In addition to its economic value, pineapple is nutritionally
42 important, being rich in vitamin C, dietary fibre, potassium, and bioactive compounds such as
43 bromelain, which contribute to antioxidant and anti-inflammatory properties.

44 Pineapple is propagated vegetatively because commercial cultivars produce few viable seeds and
45 seed propagation leads to genetic variability. The principal planting materials are crowns, slips,
46 and suckers, each differing in physiological age, size, dry matter content, and carbohydrate
47 reserves. These differences significantly influence early establishment, vegetative vigor, and
48 subsequent reproductive performance. Suckers, which arise from axillary buds near the base of
49 the mother plant, are generally larger and more physiologically mature than slips and crowns,
50 enabling them to establish faster, accumulate biomass more rapidly, and initiate flowering
51 earlier. Slips, produced on the peduncle below the fruit, are intermediate in size and
52 performance, whereas crowns are typically smaller and slower to establish due to lower initial
53 reserves (Bartholomew *et al.*, 2020). Studies have demonstrated that heavier or larger planting
54 materials often result in improved vegetative growth, earlier floral induction, and higher fruit
55 weight, emphasizing the importance of propagule quality in maximizing yield potential (Maia *et*
56 *al.*, 2021; Chen *et al.*, 2022).

57 Planting pattern are also critical determinants of pineapple productivity. Spatial arrangement
58 influences canopy structure, light interception, nutrient uptake efficiency, and microclimatic
59 conditions within the crop stand. High-density planting systems, including double-row
60 arrangements, are widely adopted in commercial production to maximize yield per unit area.
61 Although increased plant density often enhances total fruit yield per hectare, excessive
62 competition may reduce individual fruit size and quality due to limitations in assimilate
63 availability (Teixeira *et al.*, 2020). Conversely, wider spacing may favor larger fruit development
64 but reduce overall yield per hectare. Therefore, optimizing planting pattern involves balancing
65 individual plant performance with total field productivity.

66 Recent research has highlighted the interactive influence of planting material characteristics and
67 crop management practices on pineapple growth dynamics and yield formation. The response of
68 pineapple to planting density may vary depending on propagule type, as differences in initial
69 vigor and growth rate can alter competitive ability under crowded conditions. For instance, more
70 vigorous propagules such as suckers may better tolerate higher plant densities compared with
71 smaller crowns. However, comprehensive studies evaluating the combined effects of propagule
72 type and planting arrangement remain limited, particularly under specific tropical agroecological
73 conditions where soil fertility, rainfall distribution, and temperature regimes vary.

74 Given the increasing demand for improved pineapple productivity and resource-use efficiency, it
75 is essential to generate location-specific recommendations that integrate propagation material
76 selection with optimal spatial arrangement. Therefore, this study was designed to investigate the
77 interactive effects of propagule type and planting pattern on vegetative growth, reproductive
78 development, and fruit yield of pineapple under tropical production conditions.

79 **Materials and Methods**

80 Experimental site:

81 The experiment was conducted at Ogidi Village, Orire Local Government Area, Ogbomoso, and
82 Oyo State, Nigeria. The study area lies within the derived savannah agro-ecological zone of
83 southwestern Nigeria and is characterized by a tropical climate with distinct wet and dry seasons.
84 The area experiences a mean annual rainfall of approximately 1100–1300 mm, with rainfall

85 distribution occurring mainly between April and October. The average temperature ranges
86 between 25 and 32°C, and relative humidity is generally high during the rainy season. The soil of
87 the experimental site is predominantly sandy loam, typical of the derived savannah zone.

88 Experimental Design and Treatments

89 The experiment was laid out in a factorial arrangement consisting of:

90 Factor A: Propagules type

91 P1 ----- crown

92 P2-----Slip

93 P3----- Sucker

94 Factor B: Planting pattern

95 PP1---- single-row

96 PP2 ----- double-row

97 The treatments were arranged in a Randomized Complete Block Design (RCBD) with three
98 replications. Each replicate contained all treatment combinations, giving a total of six treatment
99 combinations per block replicated 4 times

100 Land Preparation and Planting

101 The experimental field was cleared, ploughed, and harrowed to obtain a fine tilth. Beds were
102 prepared according to the specified planting patterns. Planting was carried out by inserting the
103 propagules into the soil at an appropriate depth to ensure proper anchorage and root
104 establishment.

105 Crop Management

106 Healthy and uniform planting materials were selected. Suckers, slips, and crowns were trimmed
107 and air-dried prior to planting to reduce infection risk and ensure uniform establishment. Weed
108 control was carried out manually as required. Fertilizer application and other management
109 practices were implemented uniformly to avoid confounding treatment effects. Spraying of
110 cypermethrine (40m/15L) was done as the need arises

111 Data Collection

112 **Growth Parameters:** growth data were collected at 4, 6, 8, 10, 12, and 14 months after planting
113 (MAP). The parameters measured included:

- 114 • Plant height (cm): measured from the base of the plant to the tip of the longest leaf.
- 115 • D-leaf length (cm): measured from the base to the tip of the longest leaf (D-leaf).
- 116 • D-leaf width (cm): measured at the widest portion of the D-leaf.
- 117 • Number of leaves: total fully expanded leaves per plant.

118 Reproductive Parameters

119 Reproductive data recorded included:

- 120 • Days to flowering
- 121 • Days to fruiting
- 122 • Fruit length (cm)
- 123 • Fruit diameter (cm)
- 124 • Mean fruit weight (kg)
- 125 • Crown weight (g) and
- 126 • Fruit yield (t ha)

127 Statistical Analysis

128 Data collected were subjected to analysis of variance (ANOVA). Treatment means were
129 separated using Duncan's Multiple Range Test (DMRT) at 5% probability level. Significance
130 levels were determined at where applicable. Statistical analysis was performed using
131 appropriate statistical software.

132 **RESULT**

133 **Effects of Propagule Type and Planting Pattern on Plant Height**

134 Plant height was significantly influenced by propagule type at all sampling periods (4–14 MAP).
135 Suckers consistently produced the tallest plants throughout the growth period, recording
136 significantly higher values than slips and crowns ($P < 0.05$). At 14 MAP, plants established from
137 suckers attained the greatest height (118.83 cm), followed by slips (85.40 cm) and crowns (82.80
138 cm). The superior performance of suckers may be attributed to their larger initial size and greater
139 stored assimilates, which enhanced early vigor and sustained vegetative growth as shown in table
140 1.

141 Planting pattern also significantly affected plant height at most growth stages. Single-row
142 planting produced taller plants than double-row planting at 4, 6, 10, and 12 MAP ($P < 0.05$),
143 although differences were not significant at 8 and 14 MAP as shown in table 1. The significant
144 interaction between propagule type and planting pattern across most sampling periods indicates
145 that the response of pineapple height to planting density depended on the propagule used as
146 shown in fig1.

147 **Effects of Propagule Type and Planting Pattern on D-leaf length**

148 D-leaf length was significantly affected by propagule type from 6 to 14 MAP. Suckers
149 consistently produced longer D-leaves compared with slips and crowns, particularly at later
150 growth stages. At 14 MAP, suckers recorded the highest D-leaf length (41.57 cm), indicating
151 enhanced vegetative development and potential assimilatory capacity as shown in table 2.

152 .

153 Planting pattern significantly influenced D-leaf length from 6 MAP onwards, with single-row
154 planting generally producing longer leaves than double-row planting. The significant propagule
155 and planting pattern interaction suggests that optimum leaf elongation depended on the
156 combination of planting material and spatial arrangements as shown in table 3.

157 **Effects of Propagule Type and Planting Pattern on Number of Leaves**

158 The number of leaves was significantly influenced by propagule type at all sampling periods ($P <$
159 0.01). Suckers consistently produced the highest leaf numbers throughout the experiment. At 14
160 MAP, suckers recorded 37.23 leaves, significantly higher than slips (31.87 leaves) and crowns
161 (31.67 leaves) as shown in table 4.

162 Planting pattern effects were less consistent. Double-row planting produced significantly more
163 leaves at 4, 10, and 14 MAP, whereas differences were not significant at 6, 8, and 12 MAP. This
164 suggests that higher plant population density may stimulate leaf production at certain growth
165 stages as shown in table 4. The interaction effect showed that sucker propagules under double-
166 row planting produced the highest leaf number at 14 MAP (39.73 leaves), indicating that the
167 combination of vigorous planting material and higher plant density enhanced canopy
168 development as shown in table 5.

169 **Effect of Propagules and Planting Pattern and their interactions on reproductive** 170 **parameters of pineapple**

171 Propagation material significantly ($P \leq 0.05$) influenced all measured reproductive and fruit
172 parameters. Plants established from suckers produced superior fruit characteristics compared to
173 slips and crowns. Suckers recorded the highest fruit length (19.71 cm), fruit diameter (36.86 cm),
174 mean fruit weight (1.779 kg), and crown weight (327.20 g). Although suckers had slightly higher
175 days to flowering (51.43 days), crowns flowered earliest (50.67 days) but produced significantly
176 smaller fruits (10.57 cm length; 27.50 cm diameter) and the lowest fruit weight (0.631 kg).
177 Similarly, crowns recorded the highest number of days to fruiting (82.48 days), indicating
178 delayed fruit development compared to slips and suckers as shown in table 6

179 These results suggest that suckers, due to their physiological maturity and greater carbohydrate
180 reserves, enhanced fruit development and yield performance relative to slips and crowns.

181 Planting pattern also significantly ($P \leq 0.05$) affected all reproductive and fruit parameters.
182 Single-row planting resulted in slightly higher days to flowering (51.34 days) and fruiting (81.81
183 days) compared to double-row planting. However, double-row planting produced significantly
184 longer fruits (14.30 cm) and larger fruit diameter (33.47 cm) as shown in table 7. Despite this,
185 single-row planting recorded significantly higher mean fruit weight (1.211 kg) and crown weight

186 (277.50 g) compared to double-row planting (1.147 kg and 261.80 g, respectively). This
187 indicates that while double-row planting slightly improved certain fruit dimensions, single-row
188 planting enhanced overall fruit mass and crown development as shown in table 6. The interaction
189 between propagation material and planting pattern was significant ($P \leq 0.05$) for all parameters
190 measured. This indicates that the effect of planting pattern on reproductive and fruit
191 characteristics depended on the type of propagules used. Suckers consistently produced superior
192 fruit yield attributes, confirming their suitability for enhanced pineapple productivity as shown in
193 table 7

194 Fruit yield was significantly influenced by the treatment factor, as indicated by the highly
195 significant effect ($P \leq 0.01$). Mean fruit yield ranged from 22.36 to 84.71 t/ha, demonstrating
196 substantial variability among treatments. The highest fruit yield (84.71 t/ha) was significantly
197 superior to all other treatments, as evidenced by its distinct superscript letter. This was followed
198 by 60.89 t/ha and 35.63 t/ha which were also significantly different from one another.
199 Moderate yield was recorded at 30.71 t/ha while the lowest yield (22.36 t/ha) was significantly
200 inferior to all other treatments. As shown in table 7.

201 **Discussion**

202 .The results of this study demonstrate that propagule type and planting pattern significantly
203 influenced vegetative growth and reproductive of pineapple, with strong interaction effects
204 across most parameters measured. Sucker-derived plants consistently exhibited superior
205 vegetative performance, including greater plant height, D-leaf length and leaf number throughout
206 the growth period (4–14 MAP). This enhanced growth can be attributed to the greater
207 physiological maturity, larger biomass, and higher carbohydrate reserves of suckers at planting.
208 Vigorous early establishment likely improved canopy expansion and photosynthetic capacity,
209 which translated into sustained vegetative growth. Previous studies have similarly reported that
210 sucker propagules promote stronger vegetative vigor and improved assimilate accumulation
211 compared with slips and crowns (Rahman *et al.*, 2023; Silva *et al.*, 2024). Since D-leaf size is
212 strongly associated with plant nutritional status and yield potential, the superior D-leaf traits
213 observed in suckers indicate enhanced assimilatory capacity and future reproductive advantage.

214 Planting pattern significantly affected several vegetative traits. Single-row planting generally
215 promoted taller plants and longer leaves, likely due to reduced intra-specific competition for light
216 and nutrients. Conversely, double-row planting occasionally enhanced leaf number and leaf
217 width, suggesting that moderate competition may stimulate canopy expansion in vigorous
218 propagules. These findings align with reports that planting density modifies canopy architecture
219 and light interception efficiency in pineapple production systems (Costa *et al.*, 2023). The
220 significant interaction between propagule type and planting pattern indicates that vegetative
221 response to spatial arrangement is propagule-dependent. Suckers demonstrated strong
222 adaptability under both planting systems, maintaining superior growth performance even under
223 relatively higher plant density. This plasticity suggests that sucker propagules are better suited
224 for intensified production systems.

225 Propagation material significantly influenced reproductive and fruit characteristics. Suckers
226 produced longer fruits, larger fruit diameters, higher fruit weight, and greater crown weight than
227 slips and crowns. Although crowns flowered slightly earlier, they exhibited delayed fruiting and
228 inferior fruit size, indicating weaker assimilate partitioning capacity. Early flowering in less
229 vigorous propagules may reflect stress-induced reproductive transition rather than optimal
230 physiological readiness, as previously observed in pineapple production studies (Zhang *et al.*,
231 2022).

232 Planting pattern also affected reproductive parameters. While double-row planting improved
233 fruit length and diameter, single-row planting resulted in higher mean fruit weight and crown
234 weight. This suggests that reduced competition under single-row spacing enhanced assimilate
235 translocation to fruit biomass rather than dimensional elongation alone. The significant
236 interaction further confirms that fruit development is determined by the combined effects of
237 propagule vigor and spatial arrangement. Fruit yield showed highly significant variation ($P \leq$
238 0.01), ranging from 22.36 to 84.71 t ha⁻¹. The highest yield was associated with treatments
239 combining vigorous propagules and favorable planting arrangement, demonstrating that yield
240 formation in pineapple is closely linked to vegetative vigor, canopy development, and fruit mass
241 accumulation. The complete separation of treatment means indicates distinct physiological
242 responses to management practices. Similar yield responses to propagule vigor and planting
243 density have been documented in recent pineapple production systems (Rahman *et al.*, 2023;

244 Silva et al., 2024). Overall, the findings emphasize that optimal pineapple productivity requires
245 strategic selection of propagation material in combination with appropriate planting
246 configuration. Sucker propagules, due to their superior vegetative growth and assimilate
247 partitioning efficiency, are recommended for enhanced yield performance under tropical
248 production conditions.

249 Conclusion

250 This study clearly demonstrates that both propagules type and planting patterns significantly
251 influence the vegetative growth, reproductive performance, and yield of pineapple. Strong
252 interaction effects observed across most parameters confirm that pineapple growth and
253 productivity are not determined by a single factor but by the combined influence of planting
254 material and spatial arrangement.

255 Sucker plants consistently exhibited superior vegetative growth, including greater plant height,
256 longer D-leaf length, and higher leaf number throughout the growth period (4–14 MAP). Their
257 enhanced performance can be attributed to higher physiological maturity, larger initial biomass,
258 and greater carbohydrate reserves at planting.

259 Planting pattern significantly modified growth and reproductive responses. Single-row planting
260 generally favored plant height and mean fruit weight, likely due to reduced intra-specific
261 competition for light and nutrients. In contrast, double-row planting improved certain
262 dimensional fruit traits such as fruit length and diameter. However, the interaction analysis
263 revealed that sucker propagules maintained strong adaptability under both planting systems,
264 confirming their suitability for varying production intensities.

265 Reproductive and yield parameters were strongly influenced by propagule vigor. Suckers
266 produced larger fruits, higher fruit and crown weights, and achieved superior overall yield
267 performance. Although crowns flowered earlier, their delayed fruiting and reduced fruit size
268 suggest weaker assimilate partitioning efficiency. The wide yield range observed (22.36–84.71 t
269 ha⁻¹) highlights the substantial impact of management decisions on pineapple productivity.

270 Treatments combining vigorous propagules with appropriate planting configuration achieved the

271 highest yields, demonstrating that vegetative vigor and canopy development are fundamental
272 determinants of fruit mass accumulation.

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274 **Recommendations**

275 The establishment of pineapple using suckers in a double row planting system is recommended
276 in the study area

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318 **Table 1: Main effects of Propagules and planting Patterns and their interaction on the plant**
 319 **height of Pineapple leaves**

Treatments	MONTH AFTER PLANTING						320
	4	6	8	10	12	14	321
Propagation propagules (PP)							322
Crown	24.87c	32.50c	41.9c	62.93c	75.17c	82.80c	323
Slip	26.13b	34.73b	44.53b	66.83b	78.03b	85.40b	324
Suckers	27.60a	37.60a	57.77a	77.00a	95.30a	118.83a	325
Prob. F (0.05)	**	**	*	**	**	**	326
Planting Pattern (PP)							327
Single Row	27.53a	36.04a	48.24a	72.80a	84.40a	96.30a	328
Double Row	24.87b	33.84b	47.89a	65.04b	81.27b	95.35a	329
Prob. F (0.05)	**	**	Ns	**	**	Ns	330
Interactions							331
PM x PP	**	**	*	**	**	**	332

338 Means for each factor with the same superscripts along the column are not significantly different
 339 at P < 0.05 using Duncan's Multiple Range Test (DMRT)

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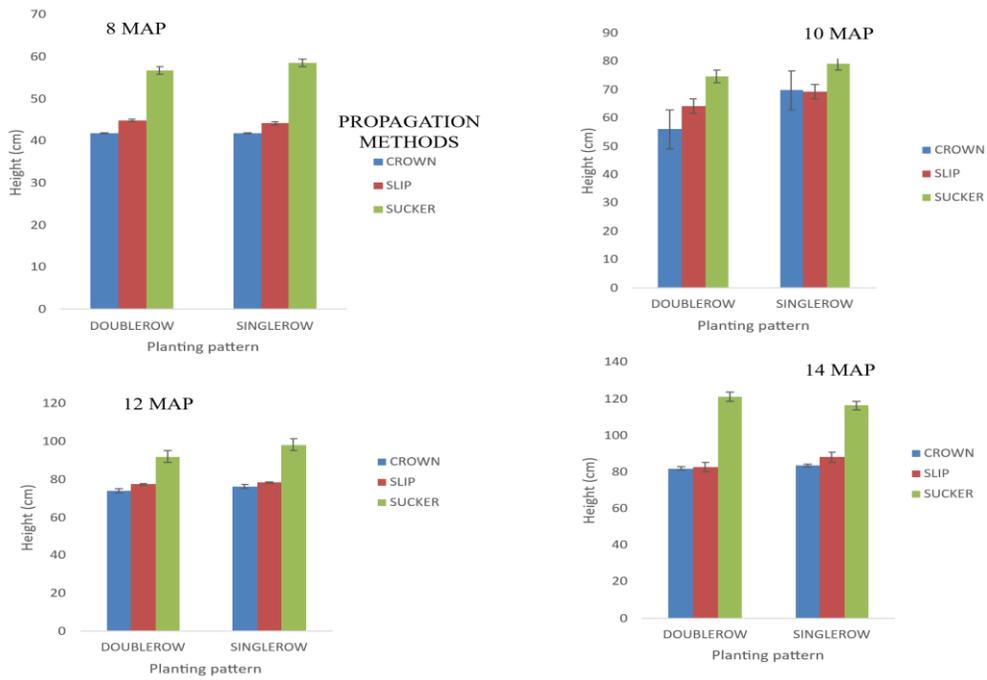


FIG 4 INTERACTIVE EFFECT OF PLANTING PATTERN AND PROPAGATION METHOD ON PLANT HEIGHT OF PINEAPPLE

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359 **Table 2: Main effects of Propagules and planting Patterns and their interaction on the D**
 360 **length of Pineapple leaves**

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Treatment	Months after Planting					
	4	6	8	10	12	14
Propagation propagules (PM)						
Crown	19.50a	20.67b	23.97c	28.70b	33.23b	36.40c
Slip	15.60a	20.03c	25.96b	29.10b	34.00b	37.70b
Suckers	20.33a	24.23a	29.97a	33.80a	37.83a	41.57a
Prob. F (0.05)	ns	**	**	**	**	**
Planting Pattern (PP)						
Single row	22.24a	22.73a	27.80a	31.27a	36.33a	39.73
Double row	14.71a	20.56b	25.47b	29.80b	33.71b	37.38
Prob. F (0.05)	ns	**	**	**	**	**
Interactions						
PM x PP	ns	**	**	**	**	**

362 Means for each factor with the same superscripts along the column are not significantly different
 363 at P < 0.05 using Duncan's Multiple Range Test (DMRT)

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374 **Table 3: Effects of Propagules and Planting Patterns and their interaction on the D -length**
 375 **leaves of Pineapple leaves**

Treatment	Months After Planting					
	4	6	8	10	12	14
Propagation propagules						
(PM)						
Crown	40.47a	2.50b	4.20a	5.87a	7.17b	8.10c
Slip	36.78b	2.60b	4.17a	5.77a	6.97b	9.13b
Suckers	36.57b	3.17a	4.27a	5.97a	8.10a	10.90a
Prob. F (0.05)	**	**	ns	ns	Ns	**
Planting Pattern (PP)						
Single row	39.53a	2.67b	4.44a	6.07a	7.56a	9.18b
Double row	36.33b	2.84a	3.98b	5.67b	7.27a	9.58a
Prob. F (0.05)	**	*	**	*	ns	**
Interactions						
PM x PP	**	*	ns	*	**	Ns

376 Means for each factor with the same superscripts along the column are not significantly different
 377 at $P < 0.05$ using Duncan's Multiple Range Test (DMRT)

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379 **Table 4: Interactive effects of propagules and Planting Patterns on the D-leaf length of**
 380 **Pineapple at 4 to 14 MAP**

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Planting Pattern	Propagation propagules		
	Crown	Slip	Sucker
		4MAP	
Double row	3.633b	3.57b	3.69b
Single row	4.46a	3.78b	3.62b
		6MAP	
Double row	2.33d	2.67c	2.67c
Single row	2.67c	2.53cd	2.53cd
		8MAP	
Double row	3.87b	3.87b	4.20ab
Single row	4.53a	4.47a	4.33a
		10MAP	
Double row	5.53c	5.87bc	5.60c
Single row	6.20ab	5.67c	6.33a
		12MAP	
Double row	6.73d	6.73d	8.33a
Single row	7.60bc	7.20cd	7.87ab
		14MAP	
Double row	8.20d	9.47b	11.07a
Single row	8.00d	8.80c	10.73a

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383 Means with the same letters within the same month are not significantly different at P
 384 <0.05 using Duncan's Multiple Range Test (DMRT).

385 MAP = Months after planting

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389 **Table 5: Effects of Propagules and Planting Patterns, and their interaction on the Number**
 390 **of leaves of Pineapple.**

Treatment	Months After Planting					
	4	6	8	10	12	14
Propagation propagules (PM)						
Crown	7.67c	11.17c	13.13c	21.03c	29.33b	31.67b
Slip	8.70b	11.90b	19.17b	22.20b	29.60b	31.87b
Suckers	10.13a	13.90a	20.40a	25.53a	31.40a	37.23a
Prob. F (0.05)	**	**	**	**	**	**
Planting Pattern (PP)						
Single row	8.62a	12.36a	17.29a	21.93b	29.96a	32.47b
Double row	9.04b	12.29a	17.84a	23.91a	30.27a	34.711a
Prob. F (0.05)	*	ns	ns	**	Ns	**
Interactions:						
PM x PP	**	ns	ns	**	Ns	**

Means for each factor with the same superscripts along the column are not significantly different at $P < 0.05$ using Duncan's Multiple Range Test (DMRT)

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400 **Table 6: Interactive effects of propagules and Planting Patterns on Number of leaves of**
 401 **Pineapples at 4 to 14 Months after Planting (MAP)**

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Planting Pattern	Propagation propagules		
	Crown	Slip	Sucker
4MAP			
Double row	7.53d	8.73c	10.87a
Single row	7.80d	8.67c	9.40b
6MAP			
Double row	11.13d	11.87bc	13.87a
Single row	11.20cd	11.93b	13.93a
8MAP			
Double row	13.53c	18.93b	21.07a
Single row	12.73c	19.40b	19.73ab
10MAP			
Double row	21.87c	22.27c	27.60a
Single row	20.20d	22.13c	23.47b
12MAP			
Double row	29.53bc	29.20c	32.07a
Single row	29.13c	30.00bc	30.73b
14MAP			
Double row	32.07c	31.60c	39.73a
Single row	31.27c	32.13c	34.73b

403 Means with the same letters within the same month are not significantly different at P < 0.05
 404 using Duncan's Multiple Range Test (DMRT).

405 MAP = Months after planting

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409 **Table 7: Main effects of Propagules, Planting Patterns and their interaction on the**
 410 **Reproductive and fruit parameters of Pineapple**

Treatment	No Days to Flowering	No Days to Fruiting	Fruit length (cm)	Fruit diameter (cm)	Mean Fruit weight (kg)	Crown weight (g)	Fruit yield (t/ha)
Propagation propagules (PM)							
Crown	50.67b	82.48a	10.57c	27.50c	0.631c	210.82c	30.71e
Slip	51.33a	80.86b	15.36b	35.14b	1.129b	270.93b	60.89c
Suckers	51.43a	81.10b	19.71a	36.86a	1.779a	327.20a	84.71a
Prob. F (0.05)	**	**	**	**	**	**	**
Planting Pattern (PP)							
Single row	51.34a	81.81a	14.13b	32.87b	1.211.a	277.50a	22.36f
Double row	50.94b	81.16b	14.30a	33.47a	1.147b	261.80b	35.63d
Prob. F (0.05)	**	**	*	**	**	**	**
Interactions							
PM x PP	**	**	**	*	**	**	**

411 Means for each factor with the same superscripts along the column are not significantly different
 412 at P < 0.05 using Duncan's Multiple Range Test (DMRT)
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426 **Table 8: Interactive Effects of propagules and Planting Patterns on the Reproductive of**
 427 **Pineapple**

Propagation propagules	Planting patterns	No Days to Flowering	No Days to Fruiting	Fruit length (cm)	Total Fruit weight (kg)
Crown	Doublerow	50.30d	82.27ab	10.68e	633.2e
Slip	Doublerow	51.47ab	80.00d	15.93c	1255.5c
Sucker	Doublerow	51.07bc	81.20c	16.29b	1746.6b
Crown	Singlerow	51.03c	82.70a	10.45e	629.9f
Slip	Singlerow	51.20bc	81.73bc	14.80d	1003.6d
Sucker	Singlerow	51.80a	81.00c	17.13a	1812.5a

428 Means for each factor with the same superscripts along the column are not significantly different
 429 at $P < 0.05$ using Duncan's Multiple Range Test (DMRT)

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