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PART I. BASIC INFORMATION

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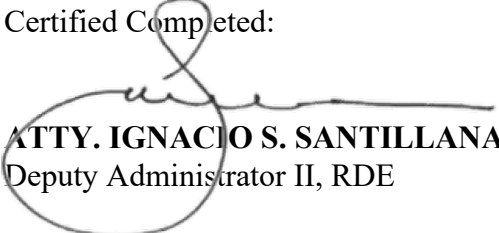
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PHL 2015 SERIES RESISTANCE SCREENING TRIAL AGAINST DOWNY MILDEW (*PERONOSCLEROSPORA* SP.)

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ABSTRACT

Planting of disease-resistant varieties is an essential component of Integrated Pest Management (IPM). Hence, after Resistance Trial against Smut and Preliminary Yield Test, selected clones from the Phil 2015 Series were subjected to Resistance Trial against Downy Mildew. The clones were planted in randomized complete block design (RCBD) with three replications. The plots were inoculated with downy mildew through natural infection by planting downy mildew-infected canepoints on the borders of blocks. Seven clones were primarily selected for being consistent highly resistant until first ratoon, Phil 15-02-0125, 27-0099, 37-0217, 114-1275, 56-0433, 216-1181, and 103-0867. Three more clones may be considered, Phil 15-02-0121, 84-0565, and 108-0921, as they remained resistant until the first ratoon. Phil 15-114-1275 also recorded the highest tool survival during the first ratoon (66.82%) compared to Phil 15-56-0489 which recorded the lowest (54.59%).

INTRODUCTION

Downy mildew (*Peronosclerospora* sp.) affects crop yield by disrupting photosynthesis. Its symptoms include white or yellowish leaf streaks on the leaf blade, coupled with white velvety fungal structures that are denser on the underside. The position of the fungal structures assists the easy dispersal of the pathogen through air and rain water. Further progression of the disease will promote growth of saprophytic fungi which will result to deep yellow or reddish-brown mottled streaks. The fungus' growth within the canes is systemic; thus, downy mildew-infected canes cannot be used as planting materials. Hence, in sugarcane fields with disease incidence of 25-85%, 9-38% losses in ton cane per hectare was observed (Dela Cueva et al., 2020).

Cultural methods exist to control downy mildew such as rogueing of infected plants, subjecting canepoints to hot water treatment (55°C for 2 hrs), and field sanitation. Chemical control can also be applied by dipping canepoints to metalaxyl solution (500 g a.i./ 200 L) for 10 min. Furthermore, planting of downy mildew-resistance varieties has been proven to be the most effective control method. All these methods can be utilized to comprise the Integrated Pest Management (IPM) and produce more effective control strategies.

Hence, Host Resistance Trial against Downy Mildew is a standard procedure annually conducted by Sugar Regulatory Administration's (SRA) researchers to continuously monitor the responses of new clones to downy mildew. Resistant clones will be further studied for their potential to become new commercialized varieties.

OBJECTIVE

General Objective:

The screening was conducted to evaluate the resistance of 2015 series of sugarcane clones to downy mildew and consolidate the result with the corresponding data on other trials.

Specific Objectives:

- 1) To provide data on reactions of clones to sugarcane downy mildew;
- 2) To determine clones that are resistant against downy mildew pathogen

METHODOLOGY

Preparation of Inoculum

Downy mildew-infected canepoints were collected and planted along the borders of the blocks. These were planted two weeks earlier than the test clones.

Planting

The study was laid-out in randomized complete block design (RCBD), with three replications, in the experimental area of Luzon Agricultural Research and Extension Center (LAREC). Selected clones from other trials and their parentage were recorded in Table 1. Clones were planted in plots two rows x five-meter length. Thirty-six canepoints were planted per row.

Data Collection

Germination and stool data count were collected during plant and ratoon canes, respectively, to determine the total number of samples. Collection of incidence data was done monthly until the 8th month after planting (MAP). Incidence data were determined based on the appearance of the symptoms of downy mildew. Percent incidence was computed as

$$\% \text{ incidence} = \frac{\text{no.of infected stools}}{\text{no.of germinated canes}} \times 100$$

Resistant clones were selected based on the standard rating scale (Hutchinson, 1970) (Table 2). The screening process was repeated until the first ratoon cane.

Table 1. List of Phil 2015 clones to be screened for host resistance against downy mildew and their corresponding parentage.

NO.	CLONES			PARENTAGE		
2	Phil 15-	02-	0125	Phil 91-55-0707	x	Phil 05-1197
3	Phil 15-	02-	0121	Phil 91-55-0707	x	Phil 05-1197
4	Phil 15-	27-	0099	Phil 85-23-4345	x	Phil 91-182-1217
7	Phil 15-	37-	0217	Phil 92-44-0751	x	Phil 93-2349
15	Phil 15-	114-	1275	Phil 90-81-0313	x	Phil 8715
18	Phil 15-	55-	0533	Phil 92-0751	x	Phil 90-19-0085
19	Phil 15-	56-	0489	Phil 92-0751	x	Q 102
20	Phil 15-	56-	0435	Phil 92-0751	x	Q 102
21	Phil 15-	56-	0433	Phil 92-0751	x	Q 102
24	Phil 15-	84-	0565	Phil 88-626-1413	x	Phil 93-65-0775
25	Phil 15-	104-	0843	Phil 04-1000	x	Phil 8715
27	Phil 15-	80-	0821	Phil 86-120-1119	x	Phil 04-1011
28	Phil 15-	108-	0921	B-3337	x	Phil 04-1011
29	Phil 15-	216-	1181	Phil 05-1197	x	Phil 89-36-0455
30	Phil 15-	103-	0867	Phil 98-149-1863	x	Phil 97-763-4549

Table 2. Sugarcane Disease Resistance Rating Scale.

Incidence (%)	Description of Reaction
1.0 - 2.5	Very Highly Resistant
2.6 - 5.5	Highly Resistant
5.6 - 7.5	Resistant
7.6 - 12.5	Intermediate Resistant
12.6 - 15.5	Intermediate Average
15.6 - 17.9	Intermediate Susceptible
18.0 - 22.5	Susceptible
22.6 - 25.6	Highly Susceptible
25.7 and above	Very Highly Susceptible

RESULTS AND DISCUSSION

Majority of clones showed declining resistance during ratoon cane (Table 3). This observation was expected due to the systemic nature of disease and the accumulation of pathogen population (Keane & Kerr, 2005). Thus, the diseased plant canes were anticipated to remain infected as ratoon canes while previously healthy ones were still being infected by the disease. Only Phil 15-108-0921 improved its resistance as ratoon. However, this result can be attributed to the lower stool survival (57.84%). Since percent incidence data depend on germination and stool count data, stool survival is also an important indicator of host resistance, especially among ratoon canes. The tested varieties showed percent survival of 54.59 – 66.82%, with Phil 15-114-1275 obtaining the highest observation (66.82%).

Table 3. Reactions of the clones against sugarcane downy mildew.

No.	Clones				Stool Survival (%)	Incidence (%)	PLANT CANE	Incidence (%)	RATOON CANE
							Description		Description
2	Phil 15	02-	0125	**	61.29	2.3	Very Highly Resistant	5.3	Highly Resistant
3	Phil 15	02-	0121	*	65.92	4.9	Highly Resistant	6.8	Resistant
4	Phil 15	27-	0099	**	64.74	4.0	Highly Resistant	5.4	Highly Resistant
7	Phil 15	37-	0217	**	59.53	1.4	Very Highly Resistant	4.7	Highly Resistant
15	Phil 15	114-	1275	**	66.82	0.0	Very Highly Resistant	4.2	Highly Resistant
18	Phil 15	55-	0533		61.62	1.5	Very Highly Resistant	9.8	Intermediate Resistant
19	Phil 15	56-	0489		54.59	4.3	Highly Resistant	15.9	Intermediate Susceptible
20	Phil 15	56-	0435		56.25	12.1	Intermediate Resistant	28.6	Very Highly Susceptible
21	Phil 15	56-	0433	**	64.22	4.4	Highly Resistant	5.3	Highly Resistant
24	Phil 15	84-	0565	*	57.26	2.1	Very Highly Resistant	6.5	Resistant
25	Phil 15	104-	0843		55.66	4.7	Highly Resistant	20.3	Susceptible
27	Phil 15	80-	0821		65.38	2.4	Very Highly Resistant	11.0	Intermediate Resistant
28	Phil 15	108-	0921	*	57.84	5.9	Resistant	5.1	Highly Resistant
29	Phil 15	216-	1181	**	55.85	3.2	Highly Resistant	4.8	Highly Resistant
30	Phil 15	103-	0867	**	57.67	5.1	Highly Resistant	3.2	Highly Resistant

**Consistent highly resistant until first ratoon

*Consistent resistant until first ratoon

For stricter selection, only clones that were able to remain highly resistant until the first ratoon were selected: Phil 15 02-0125, 27-0099, 37-0217, 114-1275, 56-0433, 216-1181, and 103-0867 (Table 3). However, three more clones which were resistant as ratoon canes may be considered: Phil 15 02-0121, 84-0565, and 108-0921. None of the clones was very highly resistant on first ratoons. Some of the selected clones also produced the highest stool survival percentage on the first ratoon: Phil 15-114-1275, 02-0121, and 27-0099.

Plants possess natural defenses against the attack of plant pathogens. Physical barriers and some secondary metabolites comprise the plant's preformed defenses. After pathogen attack, a series of induced defenses, consist of chemical signaling, further occur to express different mechanisms to prevent successful invasion of the host by the pathogen (Tabassum & Blilou, 2022). Resistance trials utilize this concept. The absence of visible symptoms may imply that the clone

possesses the abovementioned resistance mechanisms. Hence, the resistant clones may be recommended for commercialization.

CONCLUSION

Ten out of 15 clones were selected after Resistance Screening Trials against Downy Mildew, Phil 15 02-0125, 27-0099, 37-0217, 114-1275, 56-0433, 216-1181, 103-0867, 15 02-0121, 84-0565, and 108-0921. The selected clones remained highly resistant to resistant until the first ratoon. The collected data shall be consolidated with other disease and yield trials to determine the clones' potential to be commercialized as high yielding varieties (HYVs).

Resistant varieties experience breaking down of genetic resistance due to adaptation of pathogens. Hence, continuous screening of sugarcane clones is vital to sustain populations of resistant varieties. However, researchers must produce site-specific variety recommendations since genetic populations of pathogen vary on different locations.

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