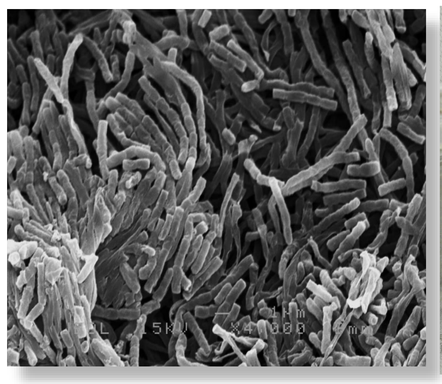
STREPTOMYCES SP. UPMRS4 AS A POTENTIAL BIOCONTROL AGENT AGAINST RICE BLAST DISEASE

Patent No. PI2017701912



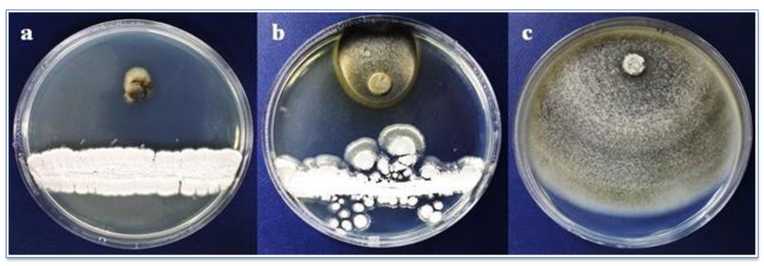


Fig. 1. Mycelial growth inhibition of *Pyricularia oryzae* UPMPo by *Streptomyces* isolates in dual culture test on PDA after 10 days of incubation at 28±1°C: a) UPMRS4; b) UPMRS28 and c) Control.

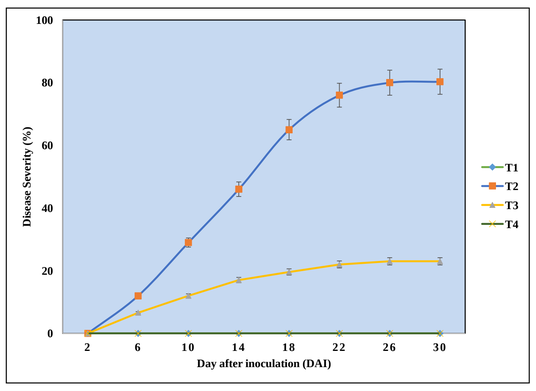


Fig. 2. Progression of rice blast (as measured by % disease severity) over time after application of treatments. (T1 = Uninoculated with pathogen (Control), T2 = Inoculated with Pathogen, T3 = Pathogen + UPMRS4, T4 = UPMRS4 alone.

Fig. 3. A: comparison effect of seed coated with *Streptomyces* sp. and Control; B: Coated seeds: (C): Control (without coating), 8 days after coating. Germination rate (%) of seeds coated with *Streptomyces* sp. = 96.6%; Control = 45.6%.

NEED

Rice blast is a global fungal disease that causes substantial decrease in yield annually. Farmers routinely use chemical fungicides to control this disease. Injudicious use of these fungicides causes health hazard to the consumers and environmental problems. Realizing this fact, some farmers are willing to try biological-based methods. However, such product is lacking in the local market.

APPROACH

- Using a natural biocontrol agent (BCA), *Streptomyces* UPMRS4, an actinomycete bacterium
- Seed coating approach to reduce application and improve effectiveness

BENEFITS/ADVANTAGES

- Non-hazardous to human health and environmental-friendly
- Effective control of rice blast disease (68% reduction)
- Effective enhancement of seed germination (51%), yield (48%), plant growth and disease resistance
- Small volume application (100 g seeds/10 mL)
- Low cost

COMPETITORS

- Agrochemicals
- Incompetent users

Table 1. Effect of *Streptomyces* sp. UPMRS4 on yield attributes in rice.

Treatment	Panicle length (cm)	No. of spikelet/panicle	100-grain weight (g)
T1	22.80 ±0.16 ab	10.66 ±0.3 ab	1.20 ±0.4 ab
T2	20.16 ±0.33 c	8.00 ±0.2 c	0.90 ±0.2 c
T3	22.00 ±0.57 b	9.91 ±0.0 b	1.33±0.3 b
T4	23.83 ±0.08 a	11.33 ±0.2 a	1.65±0.6 a

T1= Plants uninoculated with pathogen (Control), T2= Plants inoculated with pathogen, T3= Plants inoculated with pathogen and coated with RS4, T4= Plants coated with RS4 alone. Mean values within columns followed by the same letter are not significantly different according to LSD ($P \leq 0.05$).

Table 2. Effect of *Streptomyces* sp. UPMRS4 on plant growth.

Treatment	Shoot Height (cm)	Root Length (cm)	No. of Tiller/Hill	Flag Leaf Area (cm²)	Dry Shoot (g)	Dry Root (g)
T1	97.33±0.5 b	25.33±0.8 b	7 ±0.5 b	29.75±0.6 b	19.1±0.4 b	3.4±0.1 b
T2	91.66±0.5 c	16 ±0.5 c	5 ± 0.5 c	25.45±0.1 c	12.7±0.89 c	1.59 ±0.2c
T3	113 ±0.8 a	33 ±0.5a	8 ±0.5 ab	45.94±0.1 a	20.18±0.8 b	3.5±0.1 b
T4	115 ±0.8 a	31.33±0.8 a	8.66±0.3 a	45.91±0.4 a	23.42±0.4 a	4.33±0.3 a

T1= Plants uninoculated with pathogen (Control), T2= Plants inoculated with pathogen, T3= Plants inoculated with pathogen and coated with RS4, T4= Plants coated with RS4 alone. Mean values within columns followed by the same letter are not significantly different according to least significant difference ($P \leq 0.05$).

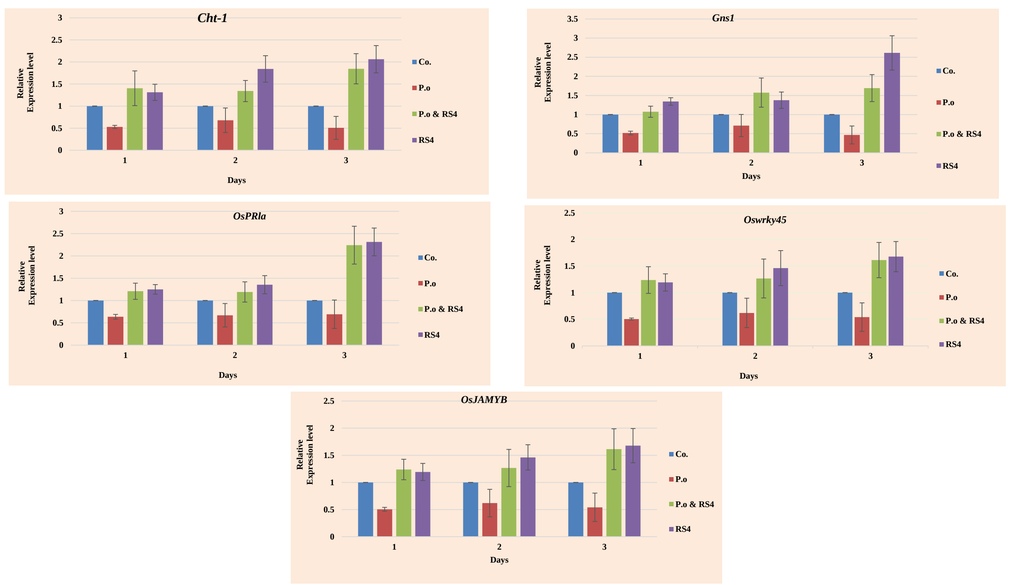


Fig. 4. Relative expression levels (mean ± SE) of target genes based on RT-qPCR analysis normalized with ubiquitin (OsUBQ5). The values shown are the expression values of target genes, chitinase (Cht-1), β-1, 3-glucanase (Gns1), pathogenesis-related gene 1 (OsPR1a), salicylic acid-responsive gene (Oswrky45) and jasmonic acid-responsive gene (OsJAMYB), 3 days after inoculation (DAI) with pathogen. Co. = Control, P.o = Pathogen, RS4 = *Streptomyces* sp.

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