Screening of Microorganisms for Plant Growth Promoting Activity of Hawm Gra Dang Ngah Rice

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Background & Rationale

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Hawm Gra Dang Ngah Rice

- Geograpfical Indications of Narathiwat
- a unique aroma like ylang-ylang flower
- high nutritional value With a large amount of calcium and phytate in brown rice
- Short harvest life, 120-130 days
- average yield per rai, 400 kg

Objectives

To screen plant growth promoting microorganisms for Hawm Gra Dang Ngah Rice

To identify plant growth promoting microorganisms for Hawm Gra Dang Ngah Rice

Expected Benefits

Know plant growth promoting microorganisms for Hawm Gra Dang Ngah Rice

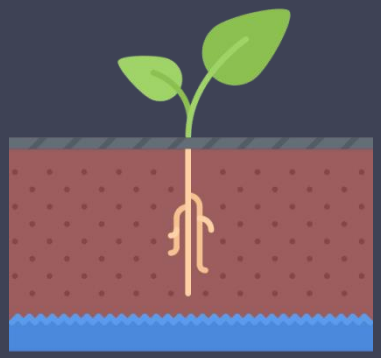
Increase the nutrient absorption potential of Hawm Gra Dang Ngah rice and reduce the cost of chemical fertilizer

Project Framework

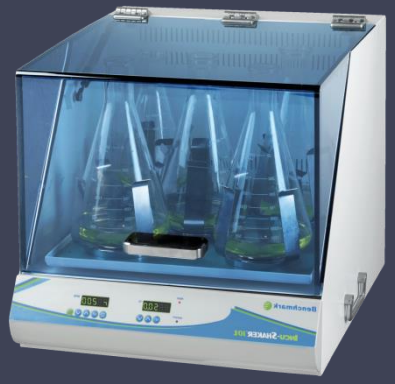
- **Isolation**
- **Growth promoting activity**
  - Phosphate Solubilization(quality & quantity)
  - Gram stain
  - Nitrogen Fixation
- **Dual culture Agar disc diffusion**
- **The effect on Hawm Gra Dang Ngah rice growth**

Methodology

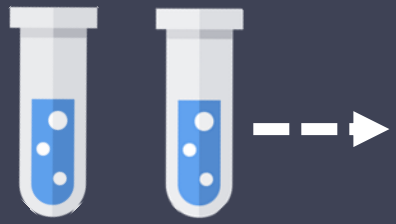
Isolation



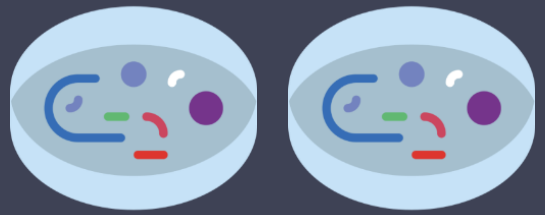
150 rpm
For
30 min



Serial
dilution



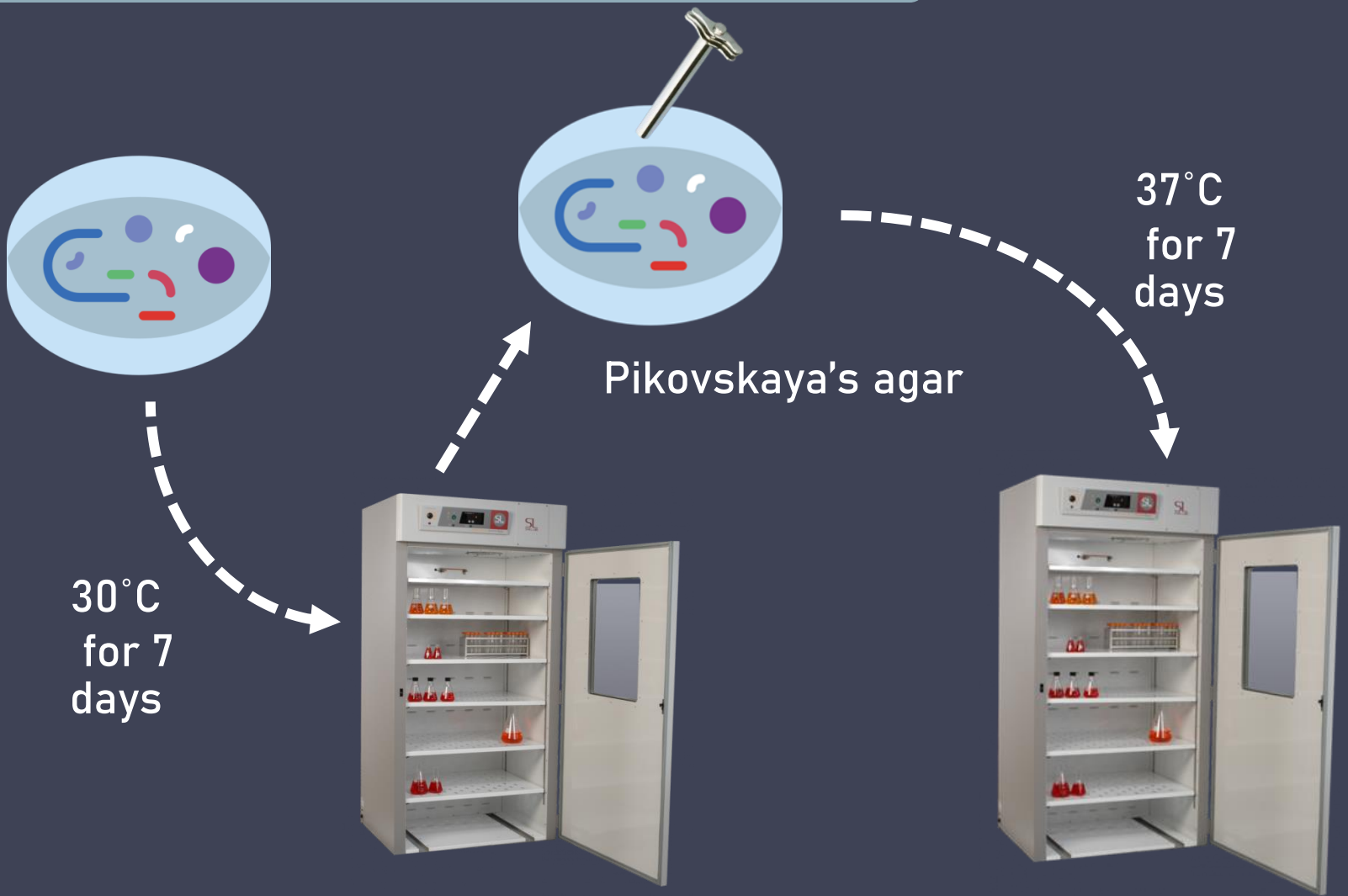
$[10^{-3}]$ $[10^{-4}]$



30°C
for 7 days

Methodology

Phosphate solubilization (quality)



Result

Phosphate solubilization

Microorganisms	Phosphate Solubilization Efficiency (PSE)
NN411	3.51 ± 0.66
D122	2.43 ± 0.25
BS	2.13 ± 0.22
D321	1.90 ± 0.10
NN321	2.18 ± 0.21
D111	2.22 ± 0.29
NN322	2.32 ± 0.14
NN311	3.27 ± 0.29

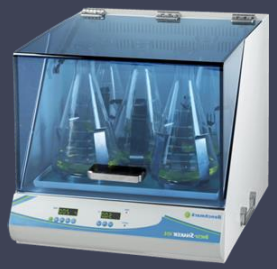
Table 1 Phosphate Solubilization Efficiency (PSE)

Methodology

Phosphate solubilization(quantity)

Pikovskaya's agar +
0.3% Tricalcium phosphate

37°C
for 5 days



10,000 rpm
For
30 min

supernate

Soluble phosphate
content

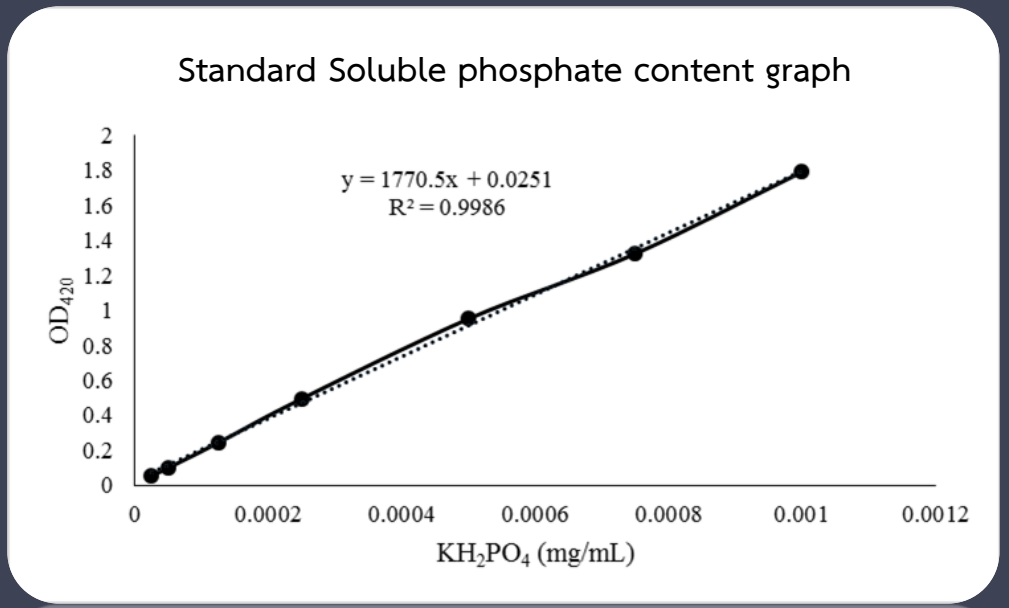


Fig 1 Standard Soluble phosphate content graph

Result

Phosphate solubilization

Microorganisms	Soluble phosphate content (µg/mL)
NN411	1.04 ± 0.13
D122	0.50 ± 0.17
BS	0.21 ± 0.10
D321	0.44 ± 0.12
NN321	0.74 ± 0.13
D111	0.23 ± 0.00
NN322	0.20 ± 0.00
NN311	1.67 ± 0.15

Table 2 Soluble phosphate content

Methodology

Nitrogen Fixation

TSA agar

N free medium agar
3 mL

37°C
for 24 hrs

OD_{600}

0.2 mL

N free Bromothymol blue
medium
50 mL

Room temp.
for7 days

Kjeldahl method

Result

Nitrogen Fixation

sample	Total N (mg L^{-1})
Control	ND
NN311	ND
NN411	ND
NT3	0.4202
NT4	0.8403
NT7	0.7469
NT8	ND
BS	0.4668
PSB1	0.8870
PSB2	1.1204

Table3
Total concentration of nitrogen in each sample with Kjeldahl Tritration method

*ND (Not Detectable)

Methodology & Result

Dual culture Agar disc diffusion

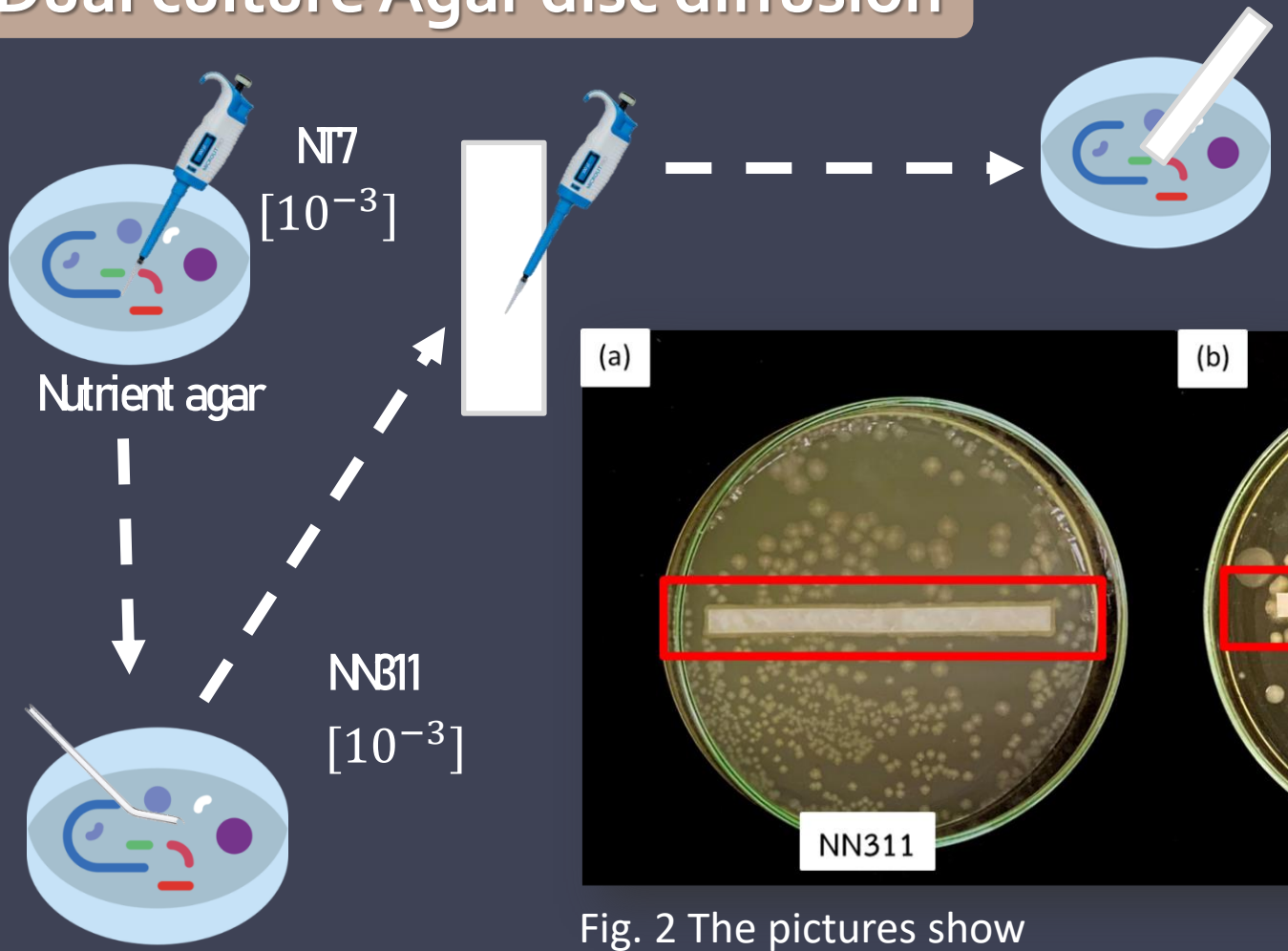


Fig. 2 The pictures show
(a) Antagonistic effect of NT7 (agar)against NN311 (paper strip)
(b) Antagonistic effect of NN311 (agar)against NT7 (paper strip)

Result

The effect on Hawm Gra Dang Ngah rice growth

Treatment	the numbers of tillers	Root length (cm.)	Stem height (cm.)	Root diameter (cm.)	Fresh shoot weight (g)	Fresh root weight (g)	Dry shoot weight (g)	Dry root weight (g)
Control	7.5 ± 0.2a	29.8 ± 1.3a	124.2 ± 3.2a	4.3 ± 0.2a	52.7 ± 4.6a	20.9 ± 2.5a	9.3 ± 0.7a	3.4 ± 0.5a
NT7	7.7 ± 0.6a	30.6 ± 4.1ab	132.5 ± 4.1a	5.5 ± 0.5ab	60.8 ± 6.0a	17.8 ± 3.1ab	9.9 ± 1.1a	3.3 ± 0.8a
NN311	8.2 ± 0.4a	31 ± 2.2ab	128.1 ± 4.2a	6.1 ± 0.3bc	63.9 ± 4.8a	24.7 ± 3.3ab	10.7 ± 0.8a	3.4 ± 0.5a
NT7+ NN311	8.3 ± 0.4a	37.7 ± 2.0b	131.8 ± 5.4a	6.8 ± 0.3c	66.6 ± 4.9a	30.6 ± 3.8c	11.7 ± 1.0b	5.2 ± 0.8b

Table 4 The growth of Hawm Gra Dang Ngah Rice

Means with the same letter within a column are not significantly different ($P \leq 0.05$)

Result

The effect on Hawm Gra Dang Ngah rice growth

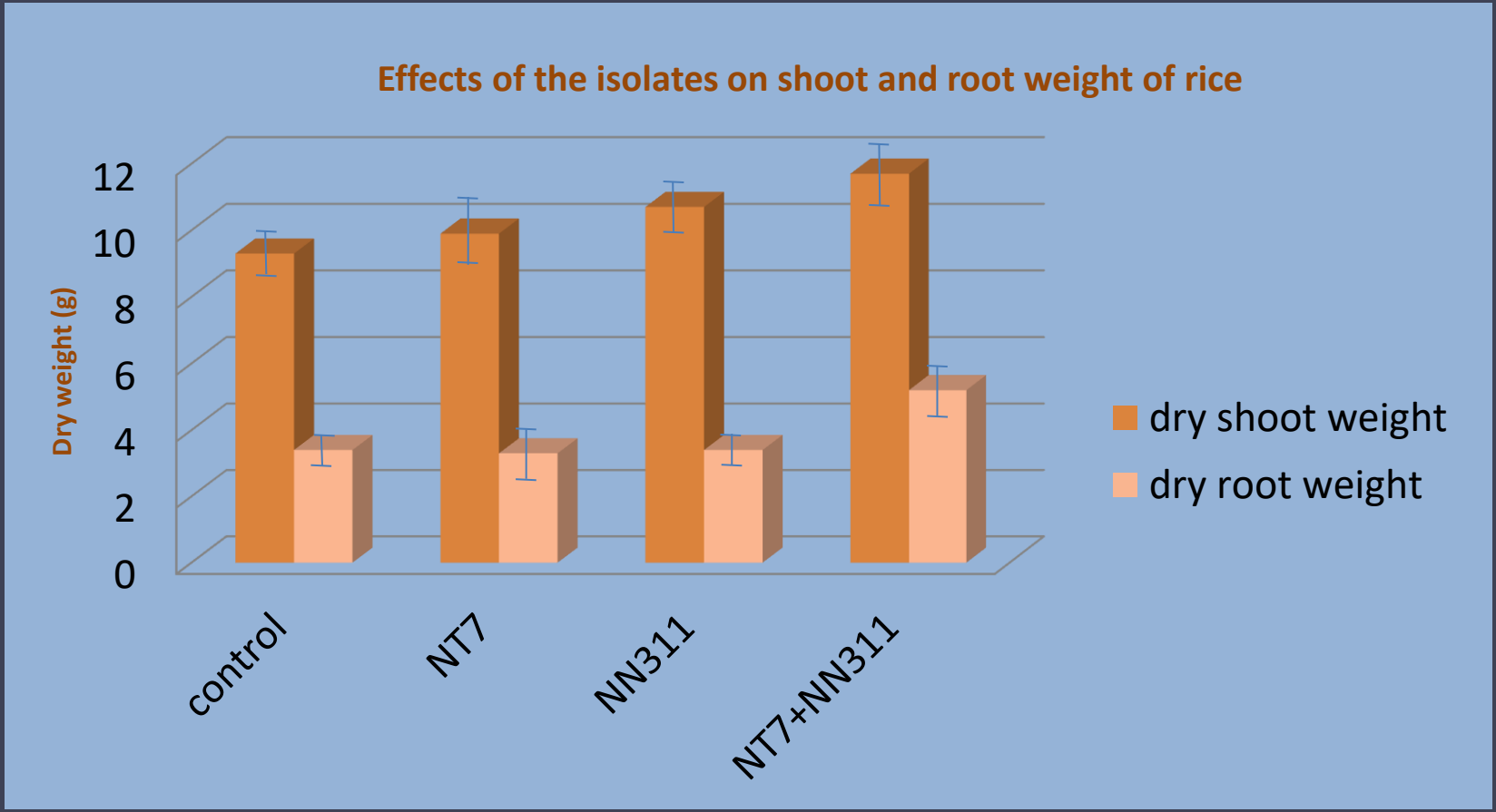


Fig.3 Effects of the isolates on shoot and root weight of rice

References

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