Biopolymer Production and its application in the field of Aquaculture

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POLYMERS

Types of polymers

- Man-made or synthetic - Non-renewable sources

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Nylon, Rubber, plastic

- Natural or Biopolymers- Renewable sources.

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Chitin, PLA, PHB

- Plastics - High tensile strength , mouldability, durability, economic oblige
  - Disposal problems
  - Land fills

- Marine environment
- Recycling

❖ Microbial Biopolymenr

- *Bacillus megaterium* by French Microbiologist Lemoigne in 1926.
- Idiophase of the growth
- Acts as carbon and energy source.
- Upstream process not cost effective.









- Identification of PHB accumulating bacteria by phenotypic methods.
- Optimization of time course, carbon source and nitrogen source for PHB accumulation.
- Extraction and estimation of PHB by using less expensive substrates.
- In-vivo challenge test in Aquaculture.

- **Collection of bacterial culture from MTCC and its revival.**

Sl.No.	Bacterial cultures	MTCC No.
1	*Bacillus circulans*	2301
2	*Bacillus licheniformis*	2617
3	*Bacillus pumilus*	1067
4	*Bacillus sphaericus*	4394
5	*Bacillus thuringiensis*	1953

- **Isolation of the *Bacillus* sp. from the soil.**
- **Rapid screening of native bacterial isolates for PHB production (Juan *et al*., 1998).**

- **Morphological, biochemical, physiological and molecular characterization.**

- **Microscopy (Burdon *et al*., 1942)**

- **Optimization of time course**

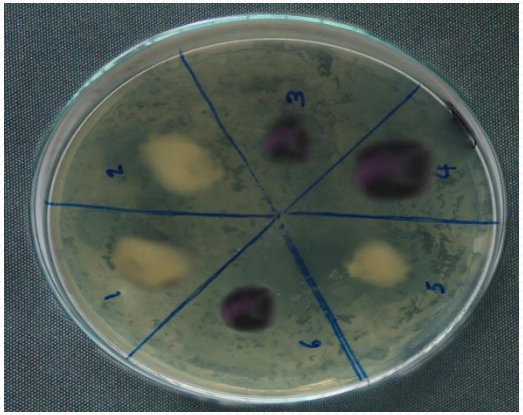
- **Disruption of cells by chemical methods and PHB estimation (Law and Slepecky, 1969)**

  Chloroform – Sodium hypochlorite extraction

- **Estimation of PHB using less expensive substrates**
  - Agro industrial wastes
  - Rice bran and Wheat bran
  - Forestry residue
  - Saw dust
- **Application of PHB in the aquaculture field**
- **In-vivo challenge test**

RESULTS

- **Isolation of *Bacillus* sp. from soil sample.**
- **Rapid screening test**

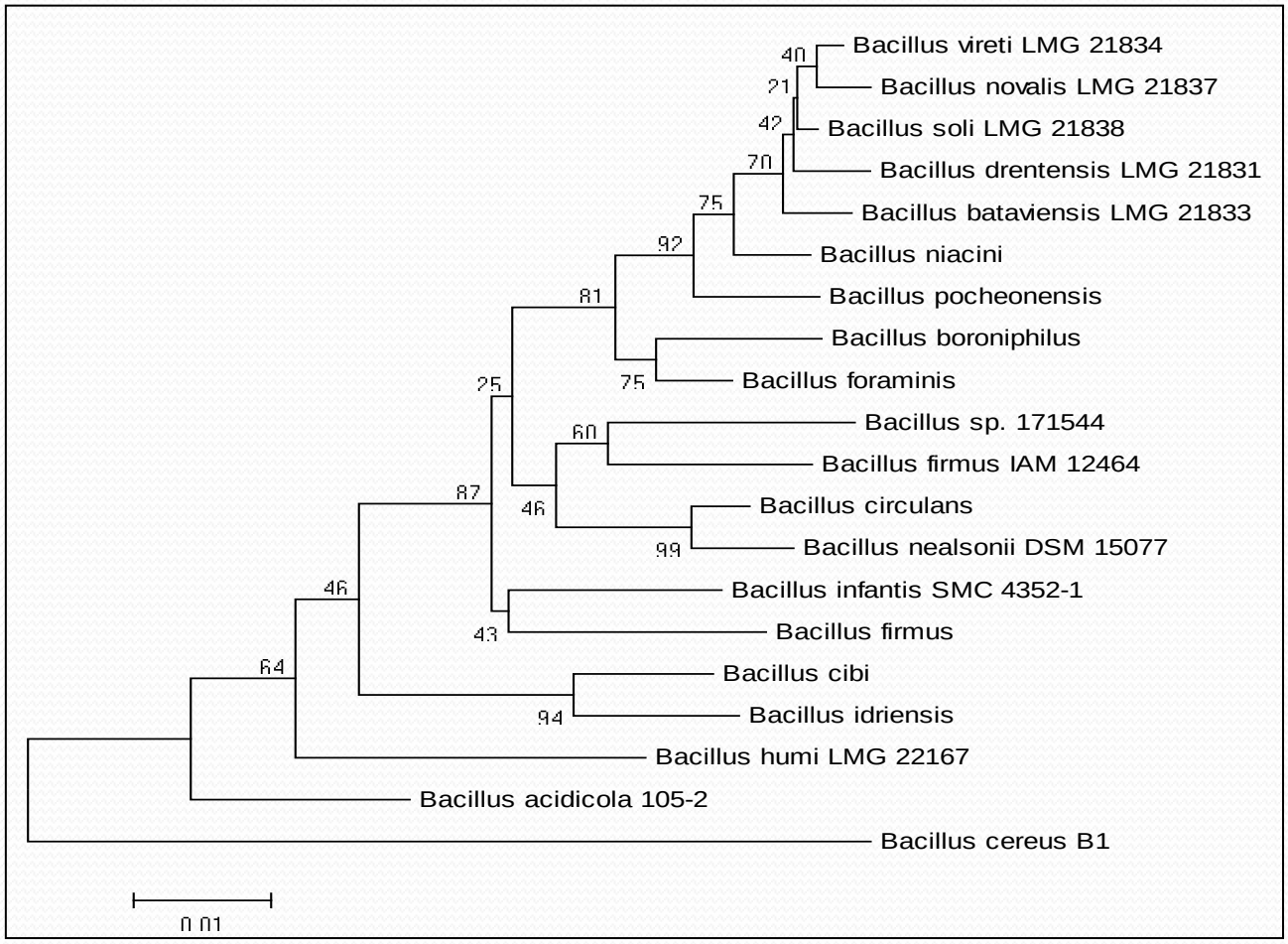


- **Morphological characterization**

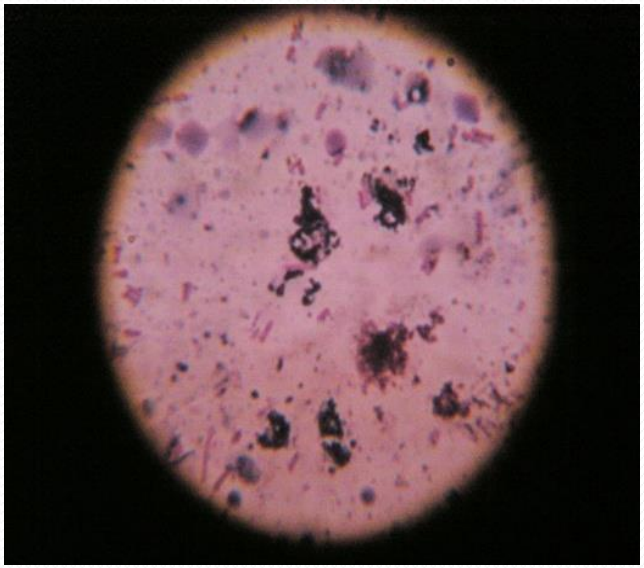


S.No	Biochemical test	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1.	Indole test	-	-	-	-	-	-	-	-	-	-
2.	Methyl red test	-	-	-	-	-	-	-	-	+	-
3.	Voges Proskauer test	+	+	+	-	+	+	+	+	-	+
4.	Citrate utilization test	-	+	+	-	-	+	-	-	-	-
5.	Urease test	-	-	-	+	+	-	-	-	-	+
6.	Catalase test	+	+	+	+	+	+	+	+	+	+
7.	Oxidase test	+	+	+	+	+	+	+	+	+	+
	Physiological test										
8.	Starch hydrolysis test	+	+	+	+	+	+	+	+	+	+
9.	Casein hydrolysis test	+	+	+	+	+	+	+	+	+	+
10.	Arginin hydrolysis test	+	+	+	+	+	+	+	+	+	+
11.	Tween 20 hydrolysis test	+	+	+	+	+	+	+	+	+	+

❖Molecular characterization

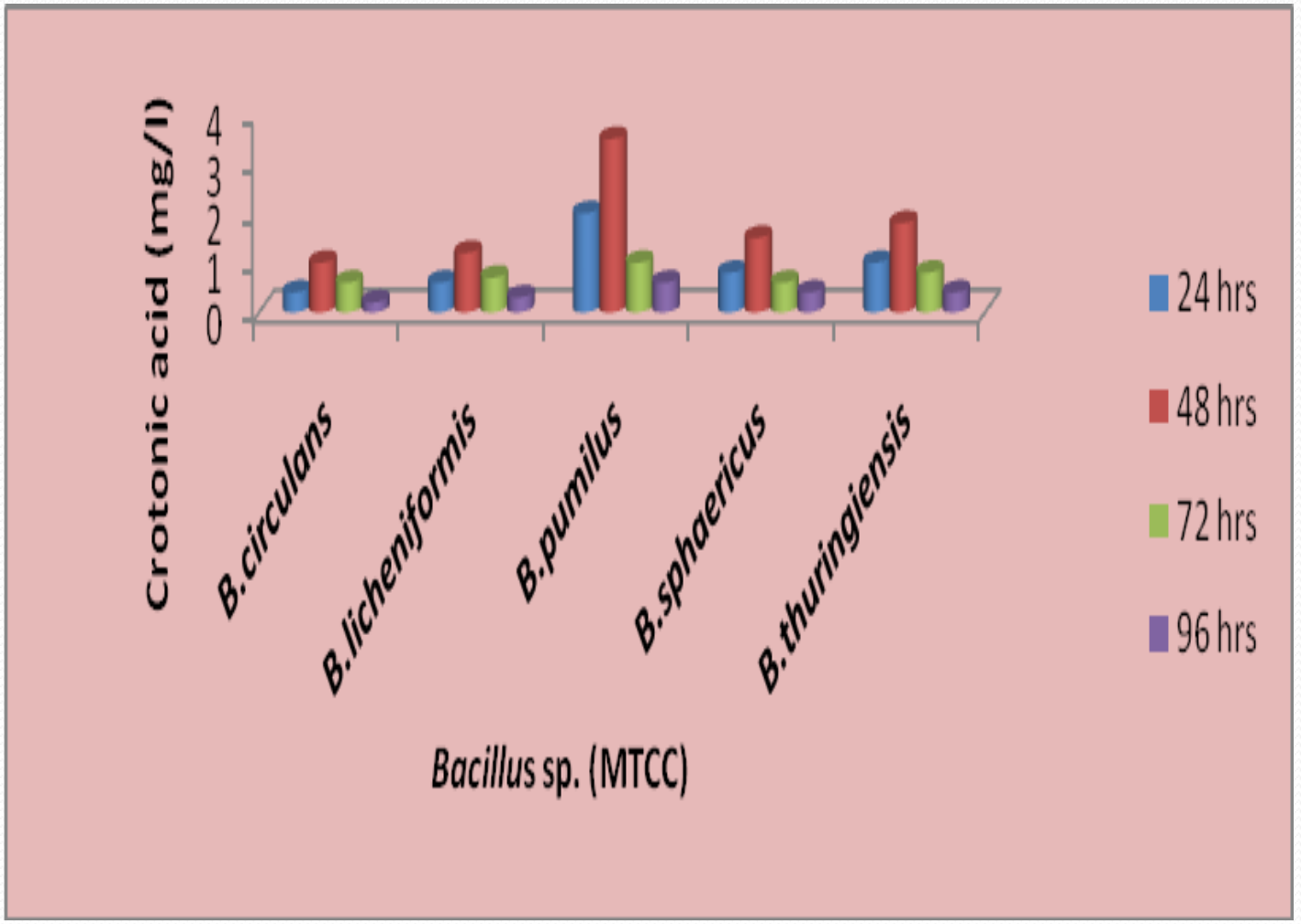


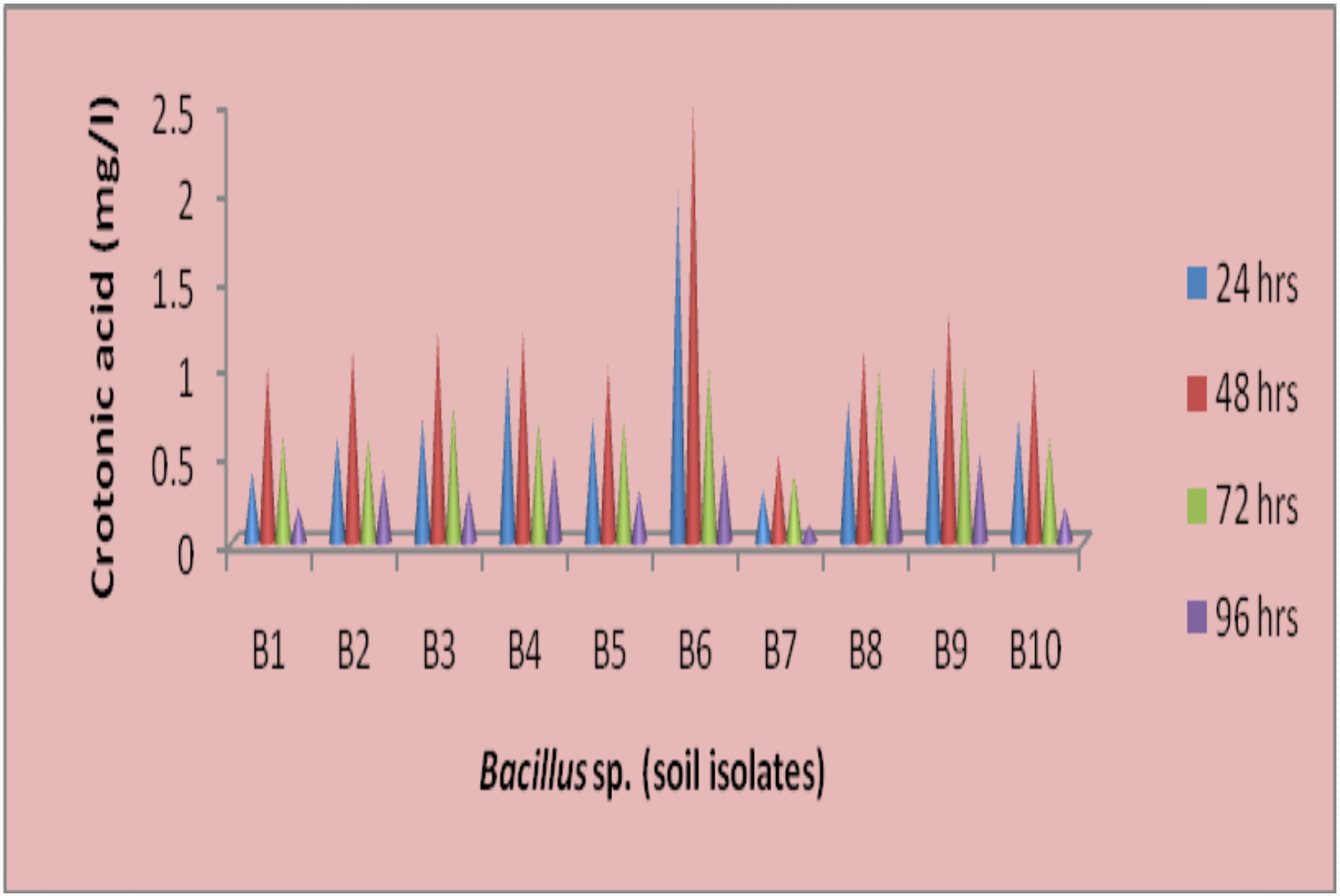
❖**Microscopy (Burdon, 1946)**



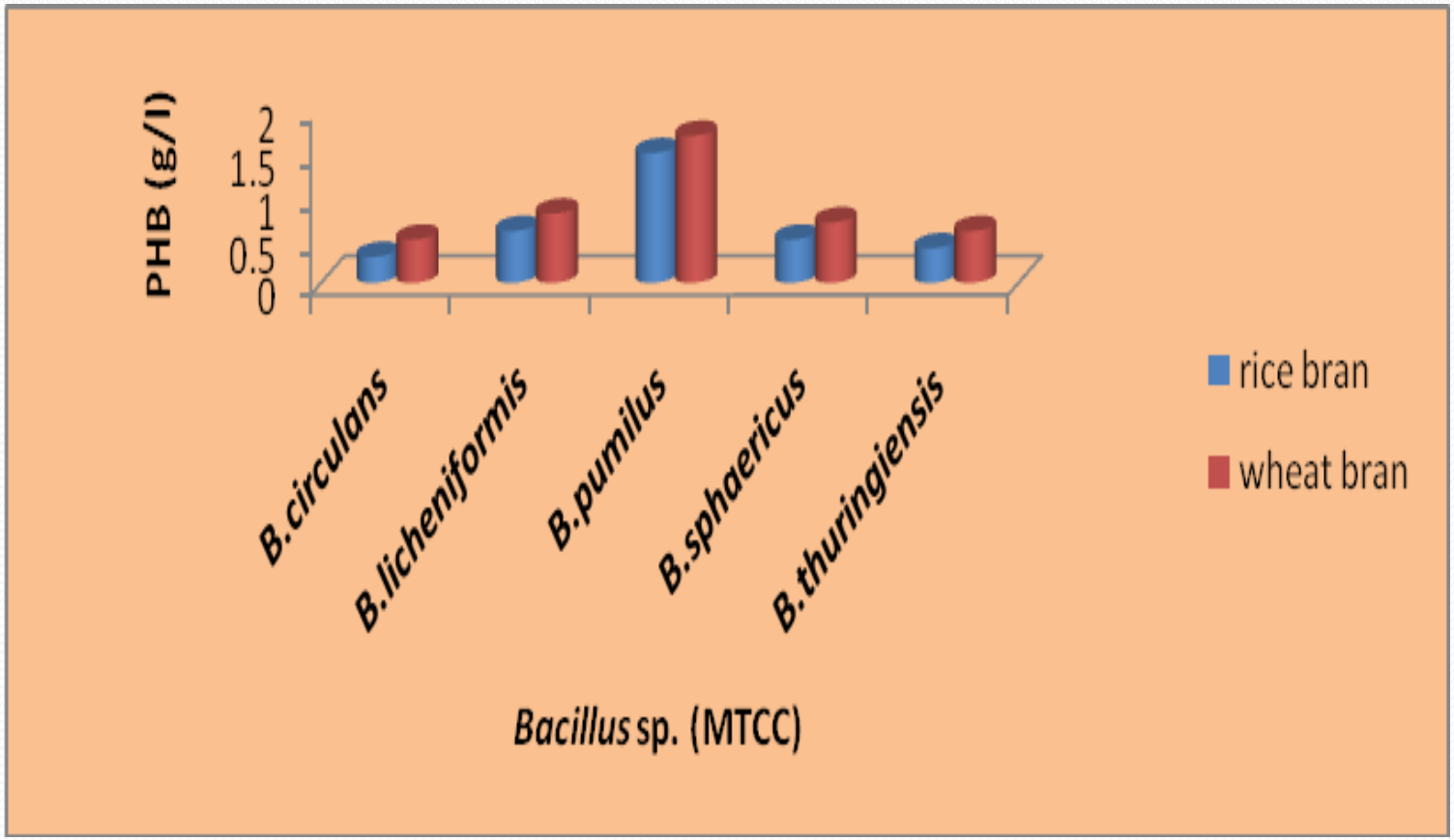
Sudan Black Staining

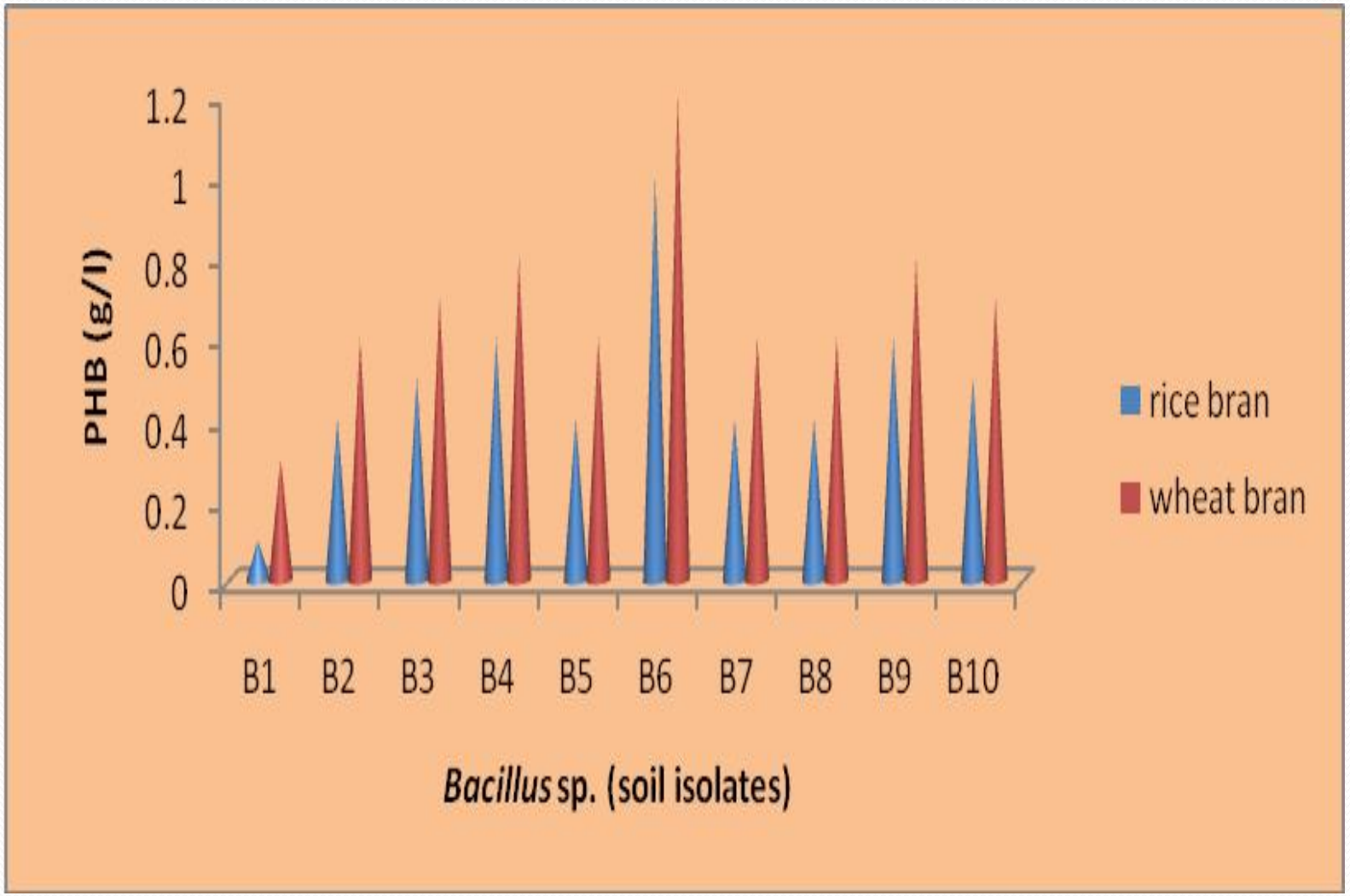
❖Optimization of time course for PHB production



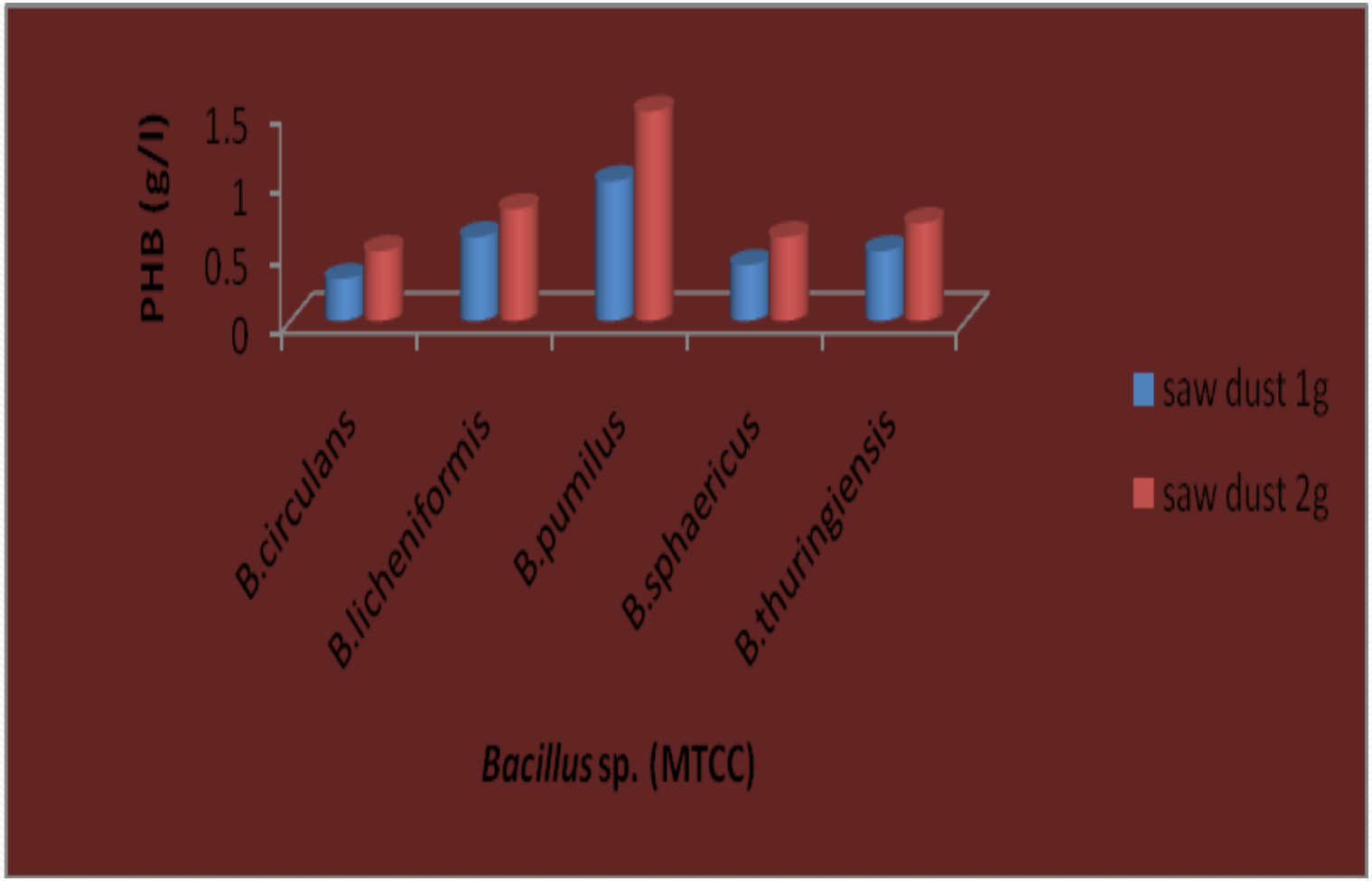

Crotonic acid (mg/l)
2.5
2
1.5
1
0.5
0
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
Bacillus sp. (soil isolates)
24 hrs
48 hrs
72 hrs
96 hrs

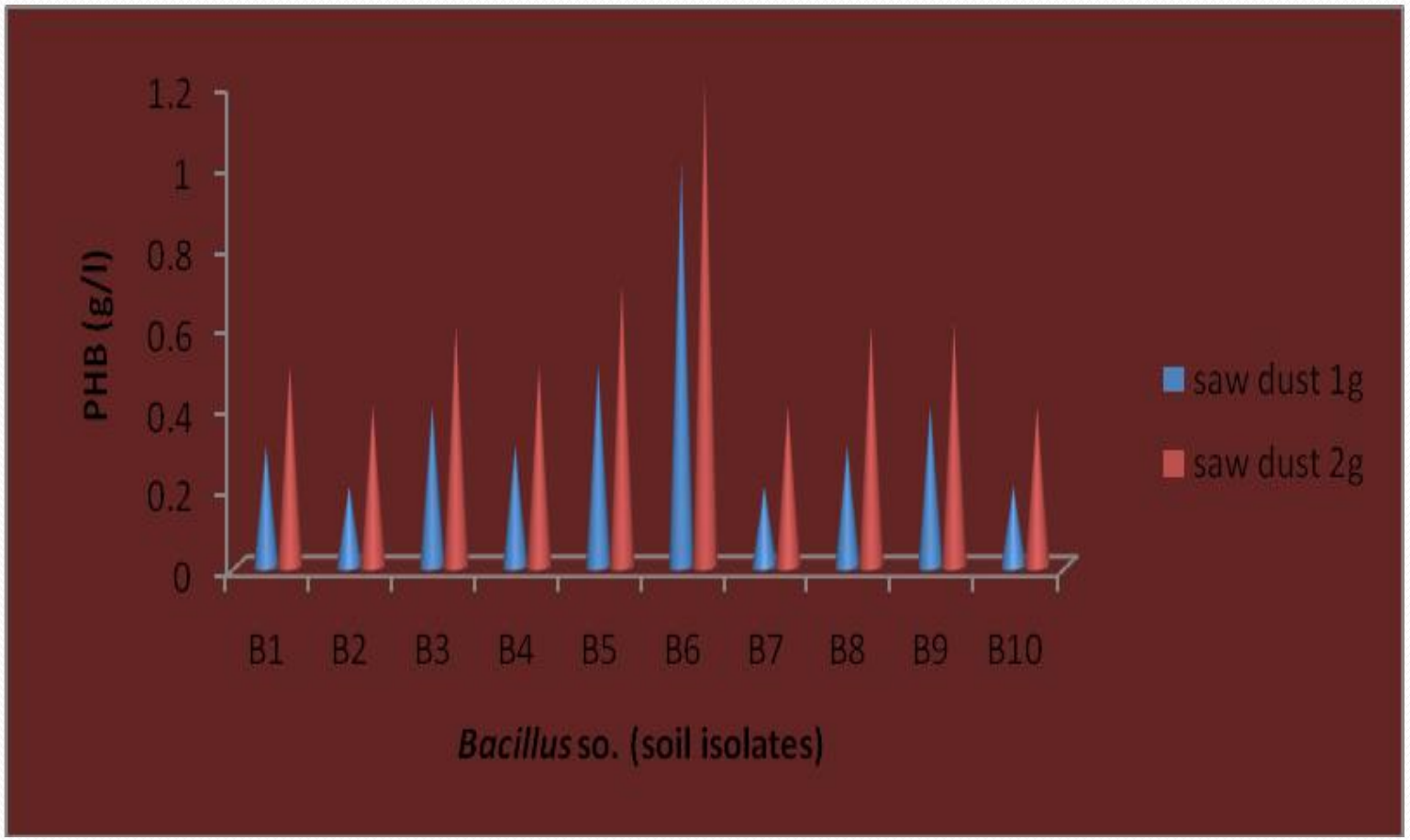
❖Accumulation of PHB in agro industrial wastes




1.2
1
0.8
0.6
0.4
0.2
0
PHB (g/l)
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
Bacillus sp. (soil isolates)
rice bran
wheat bran

- **Accumulation of PHB in forestry residue**





❖In-vivo challenge test

Conclusion





Thank you