

Pikovskaya Broth

Selective liquid medium for detection and cultivation of phosphate-solubilising microorganisms.

OVERVIEW

Pikovskaya Broth is a modification of Pikovskaya's original agar medium (Pikovskaya, 1948), further adapted by Sundara Rao and Sinha for the cultivation of phosphate-solubilising soil microorganisms. Both inorganic and organic phosphates exist in soil; many naturally occurring soil fungi and bacteria are phosphate solubilisers that play an important role in maintaining the phosphorus balance of crop plants.

The medium supplies insoluble tricalcium phosphate as the sole phosphate source. Organisms capable of solubilising this insoluble phosphate produce a visible clearing (or, in liquid culture, a reduction in turbidity/precipitate) as the calcium phosphate is converted to soluble forms, typically via organic acid production. This makes Pikovskaya media a standard screening tool for isolating and characterising phosphate-solubilising bacteria (PSB) of agricultural and biofertiliser interest.

PRODUCT IDENTIFICATION

Product Name	Pikovskaya Broth
Catalogue Number	AS-1442
Medium Type	Selective liquid medium — phosphate-solubilising microorganisms
Reference Formula	Pikovskaya, 1948; modified by Sundara Rao & Sinha
Dissolution	16.3 g/L in distilled/purified water
Final pH (25°C)	7.0 ± 0.2
Sterilisation	Autoclave 121°C for 15 minutes
Prepared Broth Appearance	Whitish, opaque solution with flocculent precipitate
Dehydrated Appearance	White to light yellow, homogeneous, free-flowing powder

MODE OF ACTION

Tricalcium phosphate, an insoluble form of inorganic phosphate, is supplied as the sole phosphorus source in the medium. Phosphate-solubilising microorganisms secrete organic acids (e.g. gluconic, citric, lactic acid) and/or acid phosphatases that dissolve or hydrolyse the calcium phosphate, releasing soluble phosphate for microbial and, ultimately, plant uptake. Dextrose provides an energy source for microbial acid production; yeast extract and ammonium sulfate supply nitrogen and growth factors; trace manganese and ferrous sulfate support enzymatic function. Solubilisation activity is detected as a zone of clearing around colonies on solid medium, or as a reduction in the flocculent precipitate in broth culture.

FORMULA — PER LITRE

Component	g/L	Role
Dextrose (Glucose)	10.000	Energy source for microbial metabolism and acid production
Calcium Phosphate (Tricalcium Phosphate)	5.000	Insoluble phosphate source — solubilisation indicator
Yeast Extract	0.500	Nitrogen, B-vitamins, accessory growth factors

Ammonium Sulfate	0.500	Nitrogen source
Potassium Chloride	0.200	K ⁺ ion source
Magnesium Sulfate	0.100	Mg ²⁺ ion source, enzyme cofactor
Manganese Sulfate	0.0001	Trace mineral, enzyme cofactor
Ferrous Sulfate	0.0001	Trace mineral, enzyme cofactor

Total: 16.3 g/L. Final pH 7.0 ± 0.2 at 25°C.

PREPARATION PROTOCOL

Step	Instruction
1	Suspend 16.3 g of dehydrated Pikovskaya Broth (AS-1442) in 1 litre of distilled or purified water.
2	Heat if necessary to dissolve the medium completely.
3	Dispense into tubes or flasks as required.
4	Sterilise by autoclaving at 121°C for 15 minutes.
5	Cool to room temperature before inoculation. Growth may be detected by subculturing or spot inoculation onto Pikovskaya Agar to visualise phosphate solubilisation as a clear halo zone.

INCUBATION PARAMETERS

Purpose	Temperature	Duration	Expected Result
General phosphate-solubiliser screening	28–30°C	3–7 days	Turbid growth; reduced precipitate if solubilising
Spot inoculation confirmation (on agar)	35–37°C	48 hours	Clear halo zone around colony

APPLICATIONS

Application	Notes
Screening of phosphate-solubilising bacteria (PSB) and fungi	Standard method for isolating candidate biofertiliser organisms from soil, rhizosphere, and compost samples
Agricultural microbiology research	Study of phosphorus cycling and plant growth-promoting rhizobacteria (PGPR)
Biofertiliser development	Pre-screening of candidate strains prior to field trial or formulation work

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STORAGE & STABILITY

Dehydrated Powder	Store below 30°C in a tightly closed container, protected from moisture and direct sunlight. Hygroscopic — reseal promptly after use.
Prepared Broth	2–8°C. Discard if evidence of contamination, discolouration, or drying is observed.
Shelf Life	Refer to expiry date on label.

LITERATURE REFERENCES

- Pikovskaya RI. Mobilization of phosphorus in soil in connection with the vital activity of some microbial species. Mikrobiologiya. 1948;17:362–370.
- Sundara Rao WVB, Sinha MK. Phosphate dissolving micro-organisms in the soil and rhizosphere. Indian J Agric Sci. 1963;33:272–278.

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