



US005227294A

# United States Patent [19]

Carrera et al.

[11] Patent Number: **5,227,294**

[45] Date of Patent: **Jul. 13, 1993**

[54] METHOD OF PRODUCING SURFACTIN WITH THE USE OF MUTANT OF *BACILLUS SUBTILIS*

[75] Inventors: Paolo Carrera; Paola Cosmina, both of Milan; Guido Grandi, Segrate, all of Italy

[73] Assignee: Eniricerche S.p.A., Milan, Italy

[21] Appl. No.: 718,464

[22] Filed: Jun. 20, 1991

[30] Foreign Application Priority Data

Jun. 22, 1990 [IT]	Italy	20738 A/90
Nov. 23, 1990 [IT]	Italy	22176 A/90

[51] Int. Cl.<sup>5</sup> ..... C12P 21/02; C12P 1/125

[52] U.S. Cl. .... 435/71.2; 435/71.1; 435/252.31; 435/252.5

[58] Field of Search ..... 435/71.2, 71.1, 252.5, 435/252.31

[56] References Cited

U.S. PATENT DOCUMENTS

3,687,926	8/1972	Arima et al.	435/71.2
5,037,758	8/1991	Mulligan et al.	435/71.2
5,061,495	10/1991	Rossall	435/70.1

FOREIGN PATENT DOCUMENTS

1803987 6/1969 Fed. Rep. of Germany .

OTHER PUBLICATIONS

Chemical Abstracts, vol. 112, No. 15, Apr. 9, 1990 abstract No. 137408Q, Schmidt, M. et al: "Influence of Manganese Ions on Growth and Surfactin Formation of *Bacillus Subtilis*", p. 582 & Dechema Biotechnol. Conf. 1987 (publ. 1988), vol. 1; pp. 333-337.

Applied Microbiology and Biotechnology, vol. 31, No. 5/6, Oct. 1989, Springer Internatinal, pp. 486-489; Mulligan, C. et al.: "Enhanced Biosurfactant Production by a Mutant *Bacillus Subtilis* Strain".

Primary Examiner—Herbert J. Lilling  
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas

[57] ABSTRACT

The present invention relates to a stable mutant of *Bacillus subtilis* which can produce surfactin with high yields, a method of producing surfactin with the use of the strain and the use of the surfactin obtained for pharmaceutical, energy and environmental problems.

11 Claims, 11 Drawing Sheets

FIG. 1

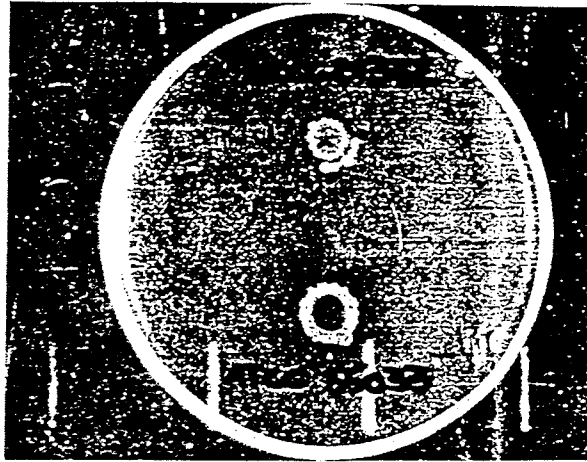


FIG. 2

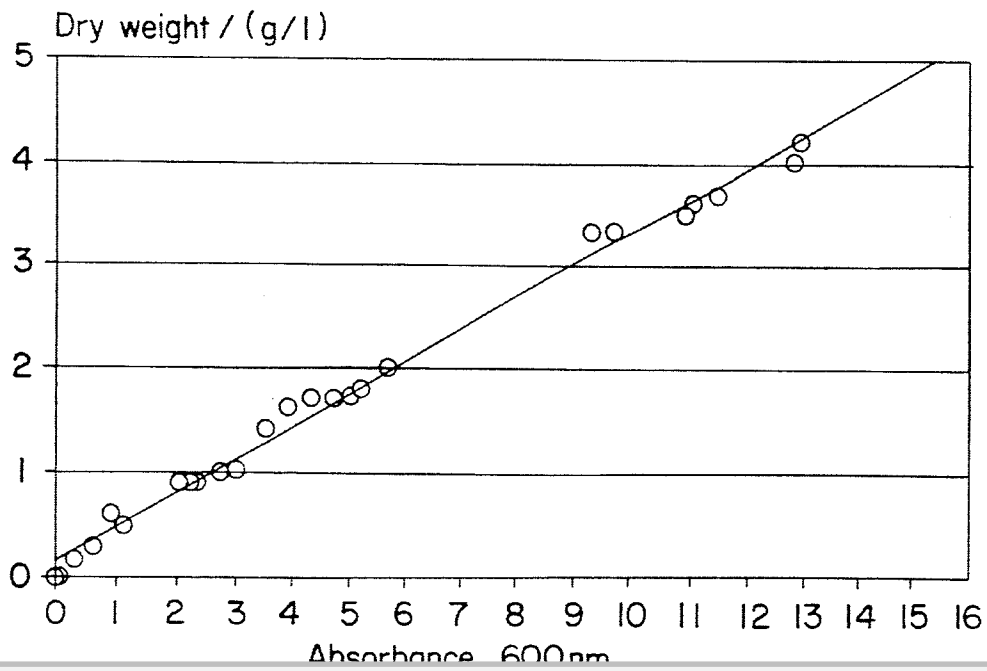


FIG. 3

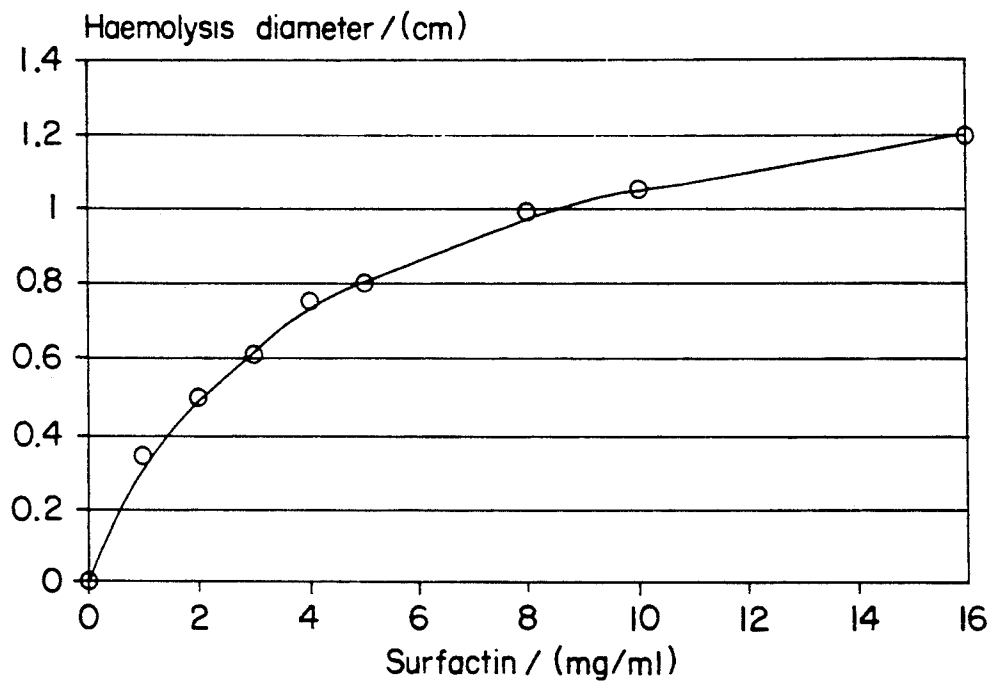
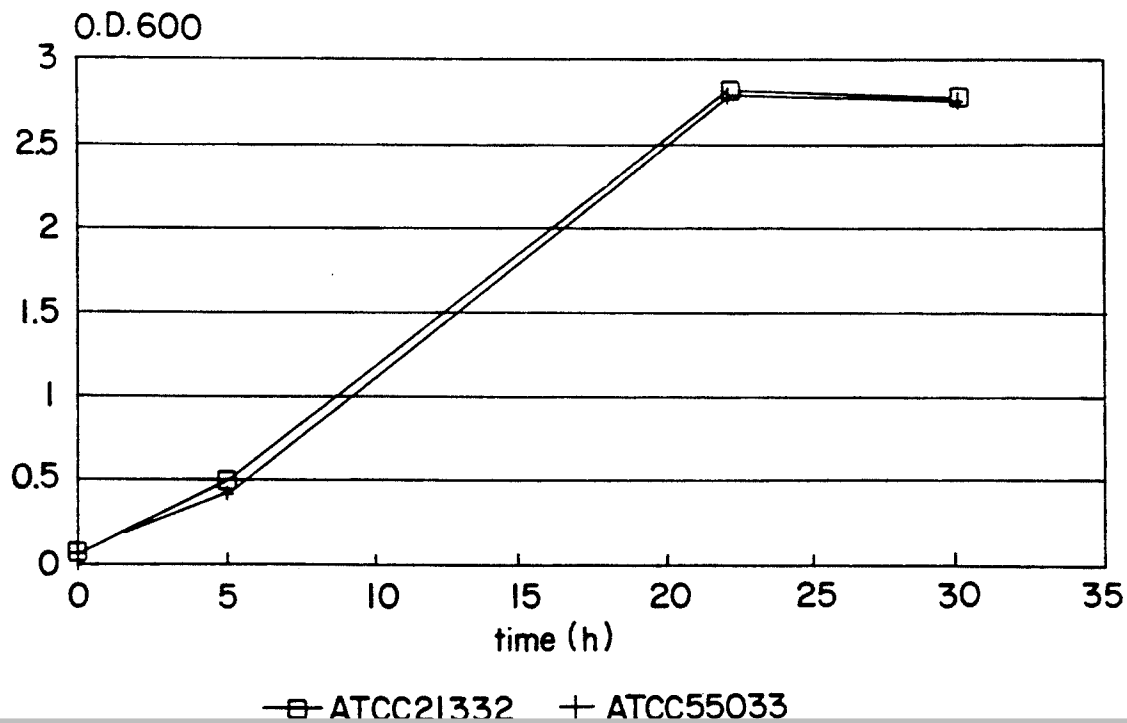


FIG. 4



—□— ATCC21332    + ATCC55033

FIG. 5

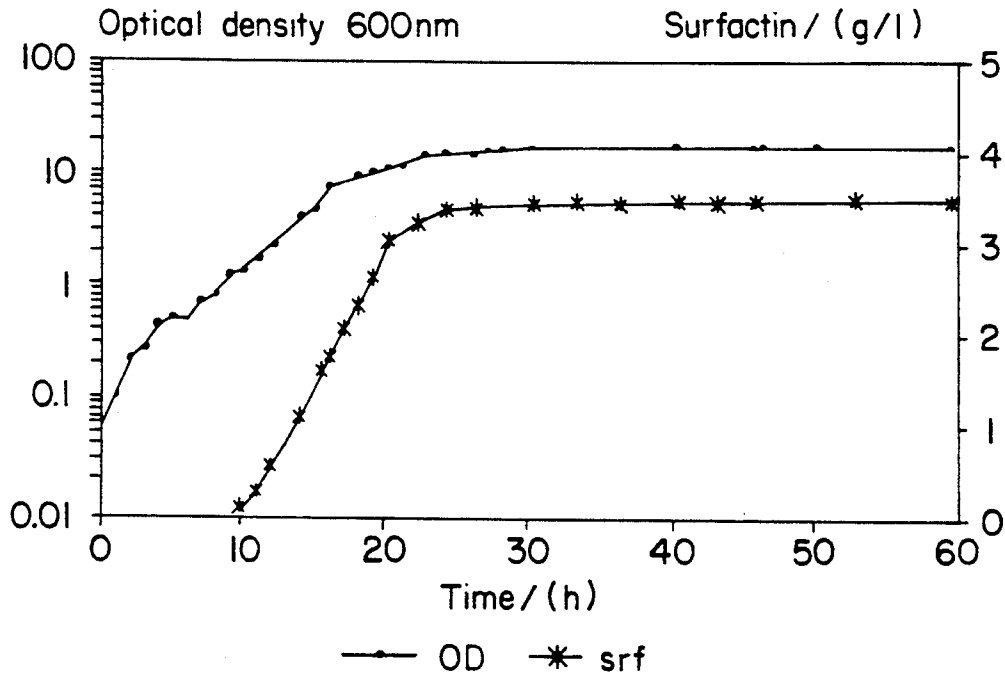


FIG. 6

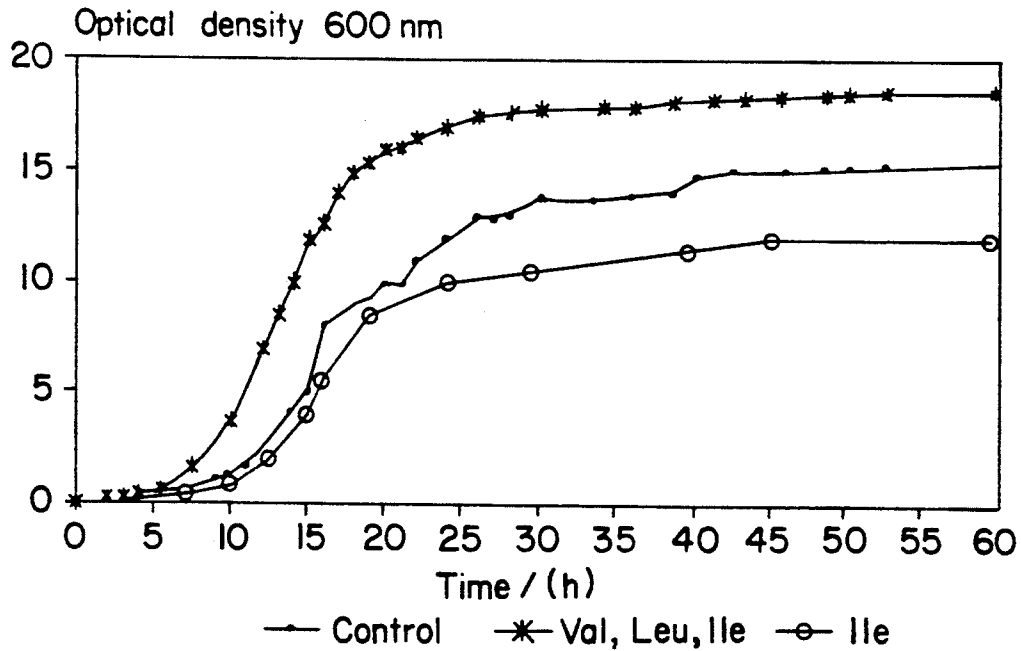


FIG. 7

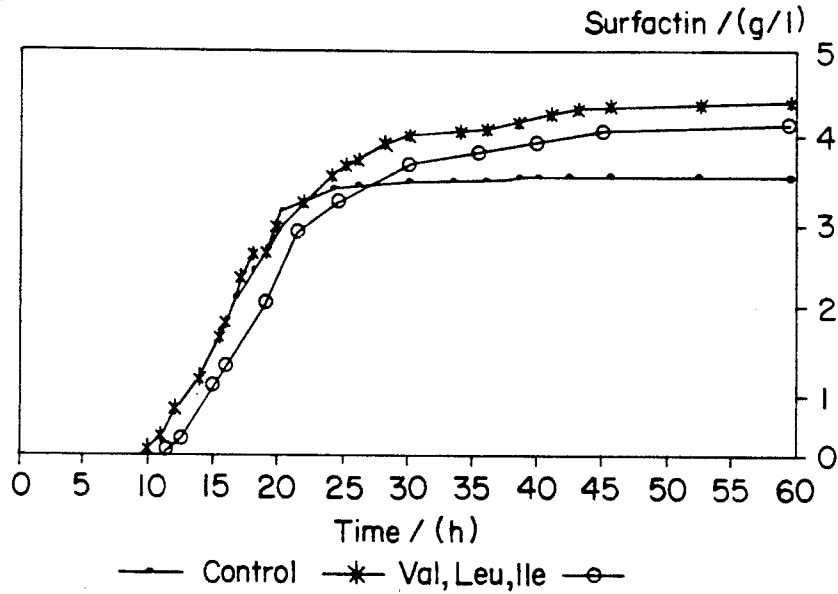
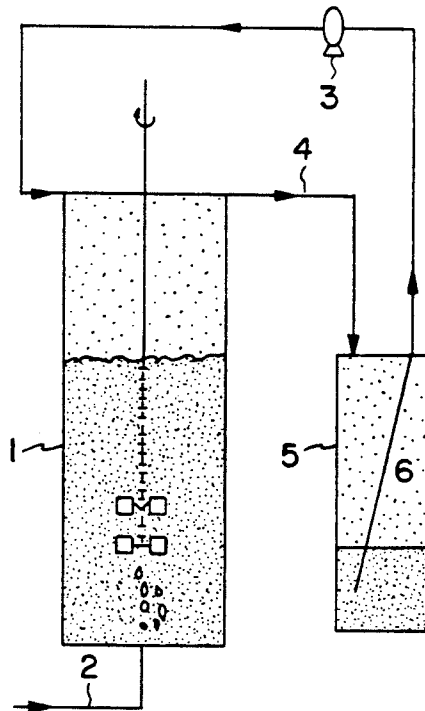


FIG. 8



# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.