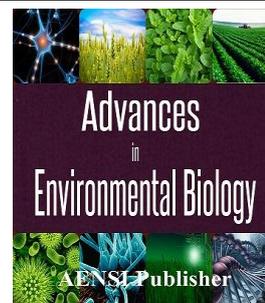




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## Morphological and Biochemical Peculiarities of *Nocardia*, Getting from Surakhani Oil Polluted Soils

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### ABSTRACT

As a result of investigation of *Nocardia rubra* and *Nocardia rubrum* we have that both of them are enough specific and they have cultural-morphological peculiarities different from each other. The results of investigations over *Nocardia* genus microorganisms getting from soiling soils of Surakhani oil deposit and studies of peculiarities of their growth on different cultures medium and their ability to use raw oil as sole source of carbon presented in this article.

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### INTRODUCTION

The problem of pollution of soil with oil and the search of methods of cleaning of oil polluted soils is very up-to-date in Azerbaijan. This problem is especially actual for Apsheron Peninsula, where the old oil deposits are still functioning [2, 3]. The use of microorganisms - destructors of carbohydrates during the cleaning of polluted places is one of perspective methods. That is why the investigation of morphological, cultural and biochemical peculiarities of *Nocardia* represent theoretical and practical interest not only for technical, but also for soil microbiology.

In our republic the microorganisms of *Nocardia* kind are not studied enough. The literary data are fragmentary and have relative character [1, 4-7]. There are few facts about distribution of *Nocardia* in the soils of different types.

The great collection of cultures of *Nocardia* has been gotten and well studied by N.A.Krasilnikov (1938). Colorless forms are more distributed in the studied soils. The red and pink pigmented forms (*Nocardia rubea* and *Nocardia rubrum*), which are more stable than the colorless forms prevail in different soils [6, 9, 10]. We have studied the physiological and cultural peculiarities of *Nocardia rubra* and *Nocardia rubrum* on the base of chair of microbiology of Baku State University.

**Results:**

The strains gotten by us first were applied to the kind of *Nocardia rubra* [9]. But following investigation showed that our strain is different from that kind with some morphological, cultural, physiological and biochemical characteristics.

For finding of basic different between *Nocardia rubra* and our strain we used the kind *Nocardia rubrum* as a standard. In order to be convinced in correctness of our doubt we have done parallel experiments with two microorganisms – *Nocardia rubra* and *Nocardia rubrum*. Colonies of *Nocardia rubra* consist of substrate and undersubstrate miccelious (destructured to sticks and coccies), bumpy, soft paste consistencies. The young colony is reddish – pink colored and during the effort it gets light-red color. The pigment does not exude into the medium. The sizes of cells is 16-35×0,7-0,9µm. The colony growths well in the synthetic and organic mediums, in Saburo's medium it growths well, but the medium does not become coloured. The air meccilious are absent. In the center the colony is a little bit protuberant, reddish.

The culture gotten by us is different from the first. The colony is round, smooth, reddish-pink coloured and consists of substrate and air miccelious. The pigment exudes in the medium and colour it into the light-red colour.

The good growth and pigmentation is observed in Saburo's medium. The medium becomes purple-red colour. During the effort the colony becomes dark-purple colour with copper lustre. The sizes of cells are  $10-25 \times 0,8-0,9 \mu\text{m}$ , the diameter of coccies forms is  $0,9-1,8 \mu\text{m}$ .

The both cultures are gram positive, not able to acids, aerobes. The optimal temperature for growth is  $26-28^\circ\text{C}$ . During the investigation of physiological and biochemical properties of both kind we have taken into the account the behavior to some sugars, organic acids, alcohols, source of nitrogen, and also their fermentative activity. The results are shown in the tables.

In table 1 we have represent the description of growth of two cultures in different nutritious mediums.

From table's data we can see that studied cultures are different from each other with their growth in nutritious mediums. The investigation of physiological and biochemical properties shows that these cultures are also different with these parameters.

**Table 1:** The description of growth of cultures in different nutritious mediums (for 3 days of evolution).

№	Strains	Nutritious medium							
		MPA pH=7,2	MPA pH=7,8	1% Glucose agar	Blood agar	Saburo	Chapeka-Docs	MPB	1% Peptone water
1	<i>Nocardia rubrum</i>	Low growth of small pink colonies on hatching after 3 days	Low growth of small colonies	Hardly noticeable growth of colonies	No gemolise	Abundant growth of colonies with red pigment, it emulgate in the medium	Abundant growth of pink colonies, a little becomes colored	Broth is colorless, there are precipitate with pigment. During the shaking the broth becomes cloud	Low growth of colonies
2	<i>Nocardia rubra</i>	Growth of single flesh-pink small colonies after 3 days	Good growth of flesh pink colonies	Good growth of small colonies	No gemolise	Good growth with pale-pink pigment, colonies can be taken from agar, the medium does not become colored	White coating, medium becomes pink-red color	Thick granular precipitate, the liquid stays colorless	No growth of colonies

In table 2 we have shown the growth of cultures on assimilation of different sugars. There are not different on the assimilation of arabinose, ribose, lactose, that is they assimilate them. *Nocardia rubra* does not assimilate fructose, galactose, mannoze and low assimilate sakharoze, while our strain assimilate fructoze, saccharine very well and low assimilate galactoze, mannoze, lactose.

**Table 2:** Assimilation of different sugars during the evolution of cultures.

The name of the kind	Shugars									Starch
	Arabinoze	Riboze	Glucose	Fructoze	Galactoze	Mannoze	sakharoze	Lactoze	Maltoze	
<i>Nocardia rubra</i>	0	0	++	0	0	0	+	0	0	0
<i>Nocardia rubrum</i>	0	0	++	++	+	+	+++	0	0	0

Notes: +++ well assimilate, + low, 0 does not assimilate

We have got interesting dates during the investigation of behavior to different acids and alcohols (table 3).

The table 3 shows that during the assimilation of acids and alcohols we can observe special differences – both cultures well assimilate acetic and oil acids. *Nocardia rubra* does not assimilate lemon and sorrel acids, while *Nocardia rubrum* assimilate them. Also we have found the differences of *Nocardia rubrum* from standard culture on behavior to some alcohols. It well develops on ethyl alcohol and glycerin, low assimilate butyl and mannit.

Microorganisms use the sources of nitrogen in the different ways (table 4).

From table 4 we can see that *Nocardia rubra* well assimilates  $\text{NaNO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$ , asparagine, peptone, but low assimilate  $\text{KNO}_3$ , urea and casein. The culture *Nocardia rubrum* well assimilates  $\text{NaNO}_3$ ,  $\text{KNO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$  and urea, but low assimilate asparagines and peptone.

The fermentative activity of cultures are shown in Table 5.

**Table 3:** The growth of cultures on different sources of nitrogen.

The name of the kind	Acids					Alcohols				
	acetic	lemon	sorrel	oil	lactic	ethyl	butyl	glycerin	mannit	sorbit
<i>Nocardia rubra</i>	++	0	0	++	+	+	0	+	0	0
<i>Nocardia rubrum</i>	++	+	+	++	++	++	+	++	+	0

Notes: ++ well assimilate; + low; 0 does not assimilate

**Table 4:** The using of sources of nitrogen by microorganisms.

The name of the kind	The sources of nitrogen						
	$\text{NaNO}_3$	$\text{KNO}_3$	$(\text{NH}_4)_2\text{SO}_4$	urea	Asparagines	peptone	kazeine
<i>Nocardia rubra</i>	+	0	+	++	+	0	+
<i>Nocardia rubrum</i>	++	+	++	++	+	+	0

**Table 5:** Fermentative activity of cultures.

The name of the kind	Transform the gelatine into liquid form	Peptonization of milk	Coagulation of milk	hydrolyses		Hydrolyses of urea (ureaza)	Hemolytic activity	Nitrification	denitrification
				Starch (amilaza)	Cellulose (citaze)				
<i>Nocardia rubra</i>	0	0	0	0	0	+	0	++	0
<i>Nocardia rubrum</i>	++	+	0	0	+	++	+	+	0

Notes: ++ well assimilate; + low assimilate; 0 does not assimilate

From the table 5 we can see that *Nocardia rubra* has low fermentative activity, it does not transform gelatin into liquid form, does not peptone milk and does not coagulate. It does not hydrolyses the starch and cellulose. It hydrolyse urea very lowly, and does not gemolise the blood agar. It differs from transferred culture on its fermentative activity. Unlike *Nocardia rubra* our culture *Nocardia rubrum* transform gelatine into liquid form. It hydrolyses urea well and lowly hydrolyses cellulose. This culture peptones milk slowly and gemolise the blood agar also slowly.

So, as a result of microbiological and biochemical investigations of *Nocardia rubra* and *Nocardia rubrum* one can conclude that both cultures are enough specific, they have different cultural-morphological properties. The ability of these microorganisms to grow at oil pollution conditions points to further investigation of their carboneoxidized activity.

#### Conclusions:

1. The investigated cultures (*Nocardia rubra* and *Nocardia rubrum*) are very different with the growth in different nutritious mediums. The investigation of physiological and biochemical properties shows that these cultures are also different with these parameters.
2. There are some differences during the assimilation of acids and alcohols: both cultures well assimilate acetic and oil acids. *Nocardia rubra* does not assimilate limone, sorrel acids.
3. *Nocardia rubra* differ from *Nocardia rubrum* with fermentative activity.

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