

Class

Actinobacteria

Subclass

Actinobacteridae

Order

Actinomycetales

Suborder

Streptosporangineae

Family

Streptosporangiaceae

Genus

Nonomuraea

The Genus Nonomuraea

To the genus *Nonomuraea* belong 18 species *Nonomuraea africana*, *angiospora*, *fastidiosa*, *ferruginea*, *flexuosa*, *helvata*, *kuesteri*, *longicatena*, *polychroma*, *pusilla*, *recticatena*, *roseola*, *roseoviolacea*, *rubra*, *salmonia*, *spiralis* and *turkmeniaca* and *Sebekia benihana* which is described new as *Nonomuraea dietziae*.

According to chemical criteria and 16S rRNA oligonucleotide sequence data of the *Actinomadura pusilla* group, Goodfellow, Stackebrandt and Kroppenstedt proposed a new genus, *Nonomuria* in 1988 to accommodate species of this *Actinomadura* group, but it was not published for validation.

Based on different investigations and phylogenetic analysis, the *Microtetraspora pusilla* group was found to be distinct from the three original *Microtetraspora* species, which include the type species *Microtetraspora glauca*, by Zhang et al. in 1998, and should be considered as a new genus *Nonomuria*. The name was corrected to *Nonomuraea*.

Aerobic, gram-positive, non-acid-fast actinomycete that forms extensively branched substrate mycelium and aerial mycelium. Aerial mycelia bear chains of spores which are hooked, spiral or straight. Spore surface folded, irregular, smooth or warty. Growth temperature ranges from 20 to 45°C, in some cases up to 55°C.

Cell wall contains meso DAP and the whole-cell hydrolysate contains madurose as the diagnostic sugar (cell wall type III/B). Predominant menaquinones are MK-9(H₄), -9(H₂) and -9(H₀). Phospholipid pattern is type IV (PE, DPG, NPG, OH-PE).

Major types of fatty acids are 10 methyl- 17- and iso 16-branched fatty acids (in some cases the amount of the former is more than the latter). G + C content ranges from 64 to 69 mol%. 16S rRNA sequence analysis indicates that the genus belongs to the family *Streptosporangiaceae*.

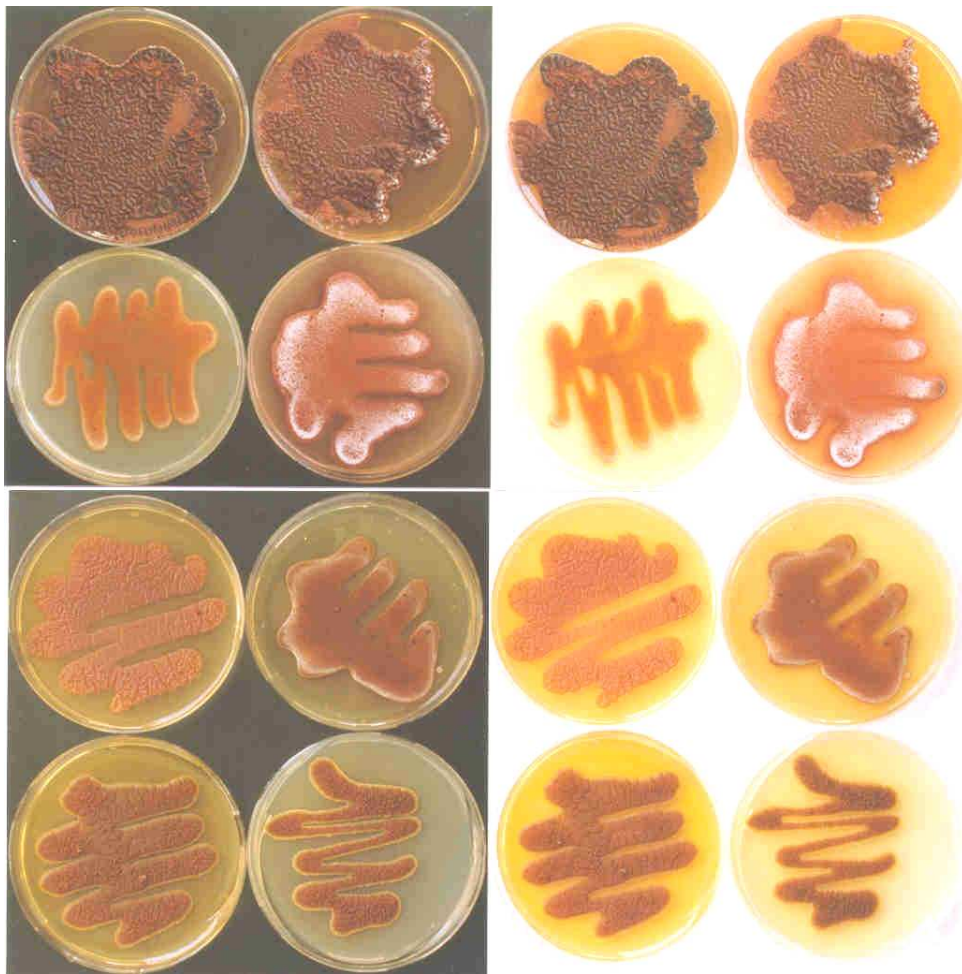
Type species is *Nonomuraea pusilla*.

Lit.: Zhang, Z., Y. Wang and J. Ruan. 1998
Reclassification of *Thermomonospora* and *Microtetraspora*
Int. J. System. Bacteriol. 48: 411-422

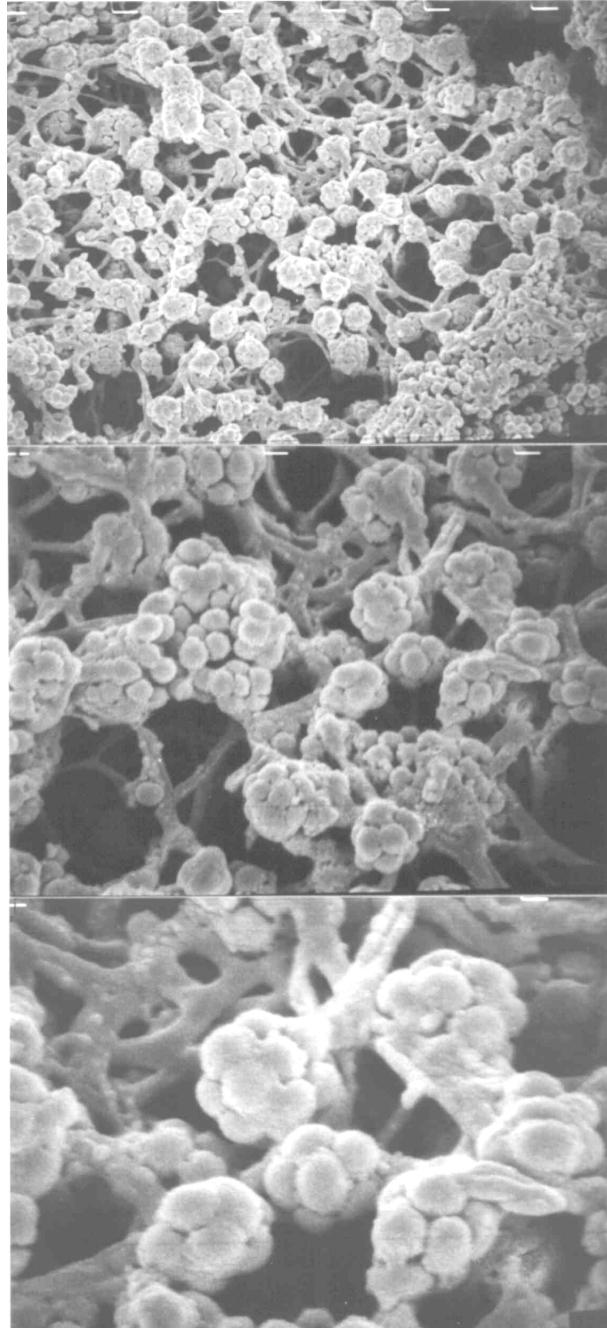
Genus Identity Card

Genus	<i>Nonomuraea</i>
Wall chemotype	meso-DAP (type III)
Whole cell sugar pattern	madurose
Fatty acid pattern	iso C 16:0, 10 methyl C 17:0
Major menaquinone (MK)	-9(H ₀ , H ₂ , H ₄)
Phospholipidtype	phosphatidylethanolamine (type IV)
Mol% G+C of DNA	64-69
Morphology	extensively branched substrate mycelium and aerial hyphae which bear chains of spores, which are hooked, spiral or straight
Type species	<i>Nonomuraea pusilla</i>

Nonomuraea roseola



Nonomuraea pusilla



Name: NONOMURAEA
Authors: Zhang et al. 1998
Status: New Genus, Corrected Name
Type species: *N. pusilla*
Literature: Int. J. Syst. Bacteriol. 48:419
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria* (sic)

Name: *Nonomuraea africana*
Authors: (Preobrazhenskaya and Sveshnikova 1974)
Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria africana* (sic)
Type strain: ATCC 35107, DSM 43748, INA 1839
Synonyms: *Actinomadura africana* (basonym),
Nocardiopsis africana
(basonym), *Microtetraspora africana* (basonym)

Name: *Nonomuraea angiospora*
Authors: (Zhukova et al. 1968) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria angiospora*
(sic)
Type strain: DSM 43173, IFO 13155, KCC A-0109, LIA 3479-30
Synonyms: *Micropolyspora angiospora* (basonym),
Microtetraspora angiospora (basonym)

Name: *Nonomuraea dietziae*
Authors: Stackebrandt et al. 2001
Status: New Species, Corrected Name
Literature: Int. J. Syst. Bacteriol. 51:1439
Risk group: 1 (German classification)
Comment: nom. corrig.: *Nonomuraea dietzii* (sic)
Type strain: DSM 44320, NRRL 11111

Name: *Nonomuraea fastidiosa*
Authors: (Soina et al. 1975) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria fastidiosa* (sic)
Type strain: ATCC 33516, DSM 43674, INMI 104
Synonyms: *Actinomadura fastidiosa* (basonym),
Microtetraspora fastidiosa (basonym)

Name: *Nonomuraea ferruginea*
Authors: (Meyer 1981) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria ferruginea* (sic)
Type strain: ATCC 35575, DSM 43553, IMET 9567
Synonyms: *Actinomadura ferruginea* (basonym), *Microtetraspora ferruginea* (basonym)

Name: *Nonomuraea flexuosa*
Authors: (Meyer 1989) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol.
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria flexuosa* (sic)
Type strain: ATCC 35864, DSM 43186
Synonyms: *Thermopolyspora flexuosa*, *Actinomadura flexuosa* (basonym), *Microtetraspora flexuosa* (basonym)

Name: *Nonomuraea helvata*
Authors: (Nonomura and Ohara 1971) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria helvata* (sic)
Type strain: ATCC 27295, DSM 43142, IMET 9584, KCC A-0143
Synonyms: *Actinomadura helvata* (basonym), *Microtetraspora helvata* (basonym)

Name: *Nonomuraea kuesteri*
Authors: Kämpfer et al. 2005
Status: New Species
Literature: Int. J. Syst. Evol. Microbiol. 55:850
Risk group: 1 (German classification)
Type strain: DSM 44753, NRRL B-24325

Name: *Nonomuraea longicatena*
Authors: Chiba et al. 1999
Status: New Species
Literature: Int. J. Syst. Bacteriol. 49:1628
Risk group: 1 (German classification)
Type strain: K-252, NRRL 15532

Name: *Nonomuraea polychroma*
Authors: (Galatenko et al. 1987) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria polychroma* (sic)
Type strain: ATCC 49500, DSM 43925, IFO 14345, IMET 9743, INA 2755, VKM Ac 1084
Synonyms: *Actinomadura polychroma* (basonym), *Microtetraspora polychroma* (basonym)

Name: ***Nonomuraea pusilla* (Type species)**
Authors: (Nonomura and Ohara 1971) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria pusilla* (sic)
Type strain: ATCC 27296, DSM 43357
Synonyms: *Actinomadura pusilla* (basonym), *Microtetraspora pusilla* (basonym)

Name: *Nonomuraea recticatena*
Authors: (Terekhova et al. 1987) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:419
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria recticatena* (sic)
Type strain: DSM 43937, IFO 14525, INA 308, VKM Ac-940
Synonyms: *Actinomadura recticatena* (basonym), *Microtetraspora recticatena* (basonym)

Name: *Nonomuraea roseola*
Authors: (Lavrova and Preobrazhenskaya 1975)
Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:420
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria roseola* (sic)
Type strain: ATCC 33579, DSM 43767, IMET 9576, INA 1671
Synonyms: *Actinomadura roseola* (basonym), *Microtetraspora roseola* (basonym)

Name: *Nonomuraea roseoviolacea* subsp. *carminata*
Authors: (Gauze et al. 1973) Gyobu and Miyadoh 2001
Status: New Combination
Literature: Int. J. Syst. Bacteriol. 51:887
Risk group: 1 (German classification)
Type strain: DSM 44170, IFO 15903, INA 4281
Synonyms: *Actinomadura carminata* (basonym)

Name: *Nonomuraea roseoviolacea* subsp. *roseoviolacea*
Authors: (Nonomura and Ohara 1971) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:420
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria roseoviolacea* (sic); subspecies automatically created according to Rule 40d
Type strain: ATCC 27297, DSM 43144, IMET 9751, KCC A-0145
Synonyms: *Actinomadura roseoviolacea* (basonym), *Microtetraspora roseoviolacea* (basonym)

Name: *Nonomuraea rubra*
Authors: (Sveshnikova et al. 1969) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:420
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria rubra* (sic)
Type strain: ATCC 27031, DSM 43768, IMET 8181
Synonyms: *Actinomadura rubra* (basonym), *Microtetraspora rubra* (basonym)

Name: *Nonomuraea salmonea*
Authors: (Preobrazhenskaya et al. 1975) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:420
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria salmonea* (sic)
Type strain: ATCC 33580, DSM 43678, IMET 9582, INA 2488
Synonyms: *Actinomadura salmonea* (basonym), *Microtetraspora salmonea* (basonym)

Name: *Nonomuraea spiralis*
Authors: (Meyer 1981) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:420
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria spiralis* (sic)
Type strain: ATCC 35114, DSM 43555, IMET 9621
Synonyms: *Actinomadura spiralis* (basonym), *Microtetraspora spiralis* (basonym)

Name: *Nonomuraea turkmeniaca*
Authors: (Terekhova et al. 1987) Zhang et al. 1998
Status: New Combination, Corrected Name
Literature: Int. J. Syst. Bacteriol. 48:420
Risk group: 1 (German classification)
Comment: nom. corrig.: IJSB 49:1623*; *Nonomuria turkmeniaca* (sic)
Type strain: ATCC 49501, DSM 43926, IFO 14348, IMET 9747, INA 3344, VKM Ac 852
Synonyms: *Actinomadura turkmeniaca* (basonym), *Microtetraspora turkmeniaca* (basonym)

Genus *Nonomuraea*
Species *pusilla*
Subspecies
Author (Nonomura and Ohara 1971) Zhang et al. 1998

Reclassification ← *Microtetraspora pusilla*
← *Actinomadura pusilla*
Status New Combination

Type species ATCC 27296, DSM 43357

Hazard group 1

Fatty acid pattern:

14 : 0 Iso	6,0	16 : 0 Iso 2 OH	4,0
14 : 0	4,0	17 : 0	3,0
15 : 0 Iso	5,0	17 : 0 10methyl	12,0
15 : 0	4,0	18 : 1 cis9	3,0
16 : 0 Iso	27,0	18 : 0	3,0
16 : 1 cis 9	3,0		
16 : 0	10,0		
16 : 0 10methyl	9,0		
17 : 0 Iso	2,0		
17 : 1 cis9	3,0		

Genus: *Nonomuraea*

FH 2354

Species: *pusilla*

Numbers in other collections: ATCC 27296

Former Actinomadura pusilla

Morphology:

	G	R
<u>ISP 2</u>	good	gray
	A	SP
	white	none
	G	R
<u>ISP 3</u>	good	red brown
	A	SP
	none	none
	G	R
<u>ISP 4</u>	good	red brown
	A	SP
	none	none
	G	R
<u>ISP 5</u>	good	red brown
	A	SP
	none	none
	G	R
<u>ISP 6</u>	good	red
	A	SP
	none	none
	G	R
<u>ISP 7</u>	good	red brown
	A	SP
	none	none

Spore chains: closed spirals

Spore surface: smooth

Sporangia: pseudosporangia

Fragmentation:

Melanoid pigment: - - - -

NaCl resistance: 5 %

Lysozyme resistance: 0

pH: Value- 5 - 8

Optimum-

Temperature : Value-

Optimum- 37 °C

Carbon utilization:

Glu	Ara	Suc	Xyl	Ino	Man	Fru	Rha	Raf	Cel
+	-	-	-	-	-	-	-	-	-

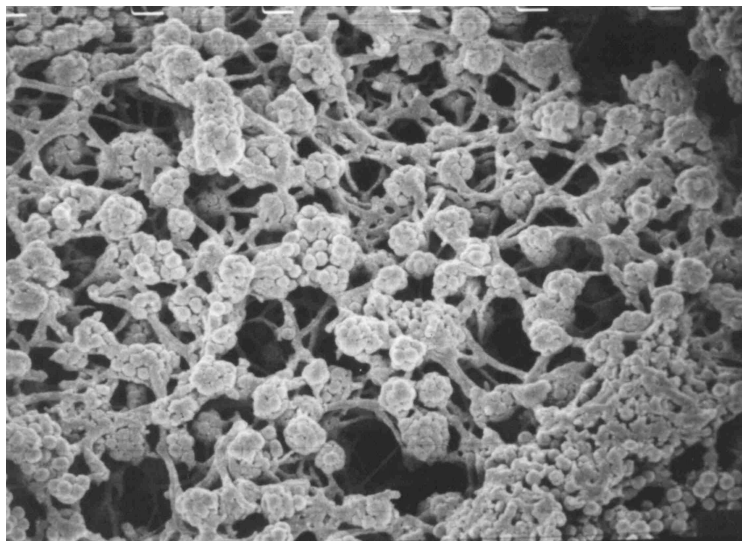
Enzymes:

Gel	Cit	Ure	Arg	Onp	Trp	Lys	Odc	VP	Ind	H2S
+	-	(+)	+	-	-	-	-	(+)	-	-
2+	3+	4+	5-	6-	7+	8-	9+	10-	11+	12+
13-	14+	15-	16+	17+	18+	19+	20+			



Nonomuraea pusilla

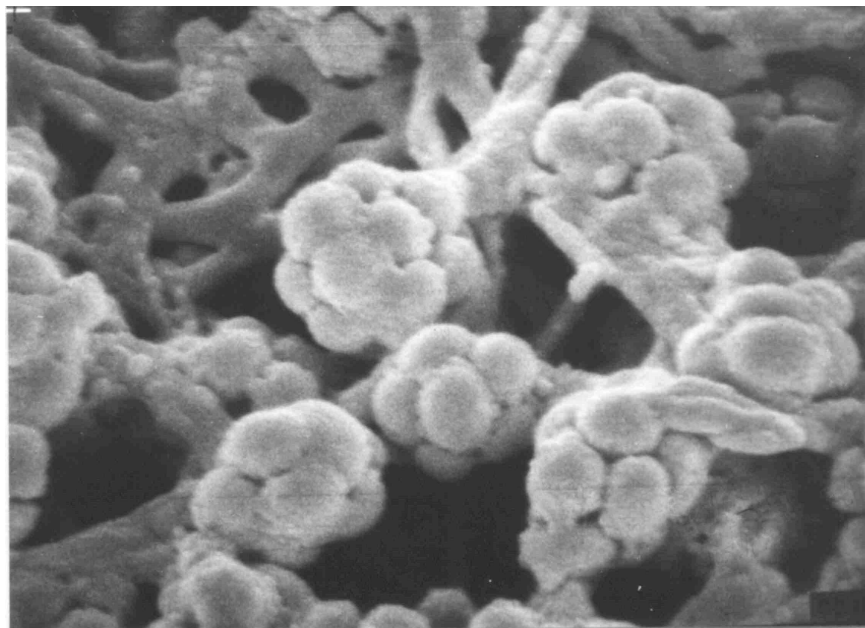
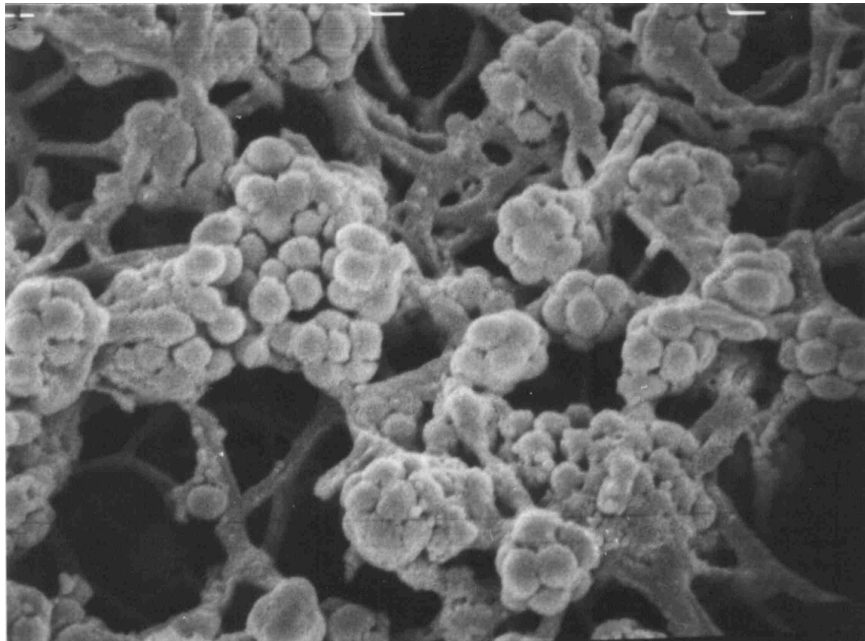
A and B –Agar plates medium 5006, 5265, 5315 and 5323



Nonomuraea pusilla

C – Agar plates medium 5318, 5322, 5337 with and without tyrosine

D – Pseudosporangia in SEM (x 2.000)



Nonomuraea pusilla

Pseudosporangia in SEM

E x 5.000 F x 10.000