On several factors which affect the conidial characteristics of *Fusarium solani* (MART.) APP. et WR. II
On the concentration of the Medium

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Contents

Introduction

In the previous paper (1), the writer reported the influence of cultural conditions upon the conidial characteristics of *Fusarium solani* (MART.) APP. et WR., with special reference to the influence of the concentration of the constituents of the medium, temperature and duration.

Since the concentration of the medium is one of the important environmental factors which affect the conidial characteristics in culturing fungi, he wanted to clarify the effect of the concentration of the medium upon the conidial characteristics of this fungus, and pursued following experiments.

Experiments and Results

As for a medium, usual BROWN's "synthetic potato dextrose" agar was used. The concentration of this medium was regarded as the standard which was expressed by N, and then the concentration was modified so as to have the grade of N/10, N/5, N/2, N, 2N, 5N, respectively. The concentration of agar was fixed to 2 per cent in each case.

The medium of each concentration was poured into Petri dishes and autoclaved. After sterilization, *Fusarium solani*, previously cultured from mono-sporous origin, was inoculated and kept at 23°C. On the 20th day, a part of fungus colonies grown on each plate was taken and was stained by ruthenium red. In

every case, the position from which the samples were taken was confined to about 1 cm. apart from the inoculum (2).

This fungus produced a great many 1-, 2- and 3-septate conidia on these media. Fifty of septate conidia were sampled at random from each colony that were formed in each concentration of the medium and the rate of appearance of 1-, 2- and 3-septate conidia among them were calculated, respectivaly, and the measurement of the size of the three-kind septate conidia were carried out. The count of the conidial septation was repeated 5 times. Furthermore, the observation regarding to the variation of the shape of conidia appeared by altering the concentration of the medium was performed.

These results are shown in Tables I-VI and Figures I-II. Since 2-septate conidia show intermediate characteristics between 3-and 1-septate conidia in the size and shape, the estimation of the significant difference in the rate of appearance of 2- septate conidia and the measurement on the size of them, appeared on the medium of each concentration, were not carried out.

Table. I. Naked-eye observations on growth forms appeared under various concentrations of the medium. (At 7th day after inoculation).

Conc. of the medium	Growth forms
N/10 & N/5	Fungous colonies thin; aerial mycelia sparse; the color of mybelia white.
N/2	Fungous colonies relatively thick; aerial mycelia plenty.
N	Fungous colonies thick; blue to violet colored sector appeared in some plates; aerial mycelia white, plenty.
2N & 5N	Fungous colonies thick; colorations under the surface of fungous colonies yellow to dark brown; sectors appeared in almost all the plate.

Table. II. The rate of appearance of 3-, 2-and 1-septate conidia produced under various concentrations.

a. 3-septate conidia.

Conc. of the medium	The rate of appearance obtained in each time.					
	Ist time	2nd.	3rd.	4th.	5th.	mean
N/10	40	40	38	34	32	36.8
N/5	22	20	12	20	16	18.0
N/2	8	12	4	16	18	11.6
N	8	14	10	16	10	11.6
2N	16	18	18	22	20	18.8
5N	30	32	32	32	28	30.8

b. 2-septate conidia.

Conc. of the medium	The rate of appearance obtained in each time.					
	1st time	2nd.	3rd.	4th.	5th.	mean
N/10	0	8	10	6	12	7.2
N/5	6	8	4	8	6	6.4
N/2	0*	2	2	2	2	2.0
N	4	2	6	2	6	4.0
2N	8	2*	8	6	8	7.5
5N	16	14	12	10	8	12.0

* Rejectable

c. 1-septate conidia.

Conc. of the medium.	The rate of appearance obtained in each time.					
	1st time	2nd.	3rd.	4th.	5th.	mean
N/10	60	52	48	60	56	55.2
N/5	72	72	84	72	78	75.6
N/2	92	86	94	82	80	86.8
N	88	84	84	82	84	84.4
2N	76	80	74	72	72	74.8
5N	54	54	56	58	64	57.2

Table. Ⅲ. The judgement (4) (5) of the significant difference.

a. 3-septate conidia.

1. Significant difference of the rate of appearance by altering the concentration of the medium.

J_1(N/10)	J_2(N/5)	J_3(N/2)	J_4(N)	J_5(2N)	J_6(5N)	
40	22	8	8	16	30	
40	20	12	14	18	32	
38	12	4	10	18	32	
34	20	16	16	22	32	
32	16	18	10	20	28	Total
184	90	58	58	94	154	638
T_1	T_2	T_3	T_4	T_5	T_6	T
5	5	5	5	5	5	30

$S_{RJ}=16542-13568.1=2973.9$

$S_J=16247.2-13568.1=2679.1$

$S_{R(J)}=2973.9-2679.1=294.8$

Factor	SS	f	V
J	2679.1	5	535.82
R(J)	294.8	24	12.4
R J	2973.9	29	

$F=535.82/12.4=43.21$

$F^{n_1}_{n_2}(0.05)$from F-table=2.57, $n_1=5$, $n_2=24$.

Thorefore, the significant difference has been recognized.

2. Significant difference of the rate of appearance in each concentration.

Conc.	Sample mean	No. of sample	u^2	F	$(\bar{x}-\bar{y})^2/w^2$	F_0	Judgement
N/10 N/5	36.8 18.0	5 5	5.55 16.0	$F<6.39$	32.7	81.75	+*
N/5 N/2	18.0 11.6	5 5	16.0 8.2	$E<6.39$	3.4	8.6	+
N 2N	11.6 18.8	5 5	10.8 5.2	$F<6.39$	6.5	16.2	+
2N 5N	18.8 30.8	5 5	5.2 3.2	$F<6.39$	34.3	85.8	+
N/10 5N	36.8 30.8	5 5	5.55 3.2	$F<6.39$	8.2	20.5	+

* Signicant in 95% of confidence limit.

b. 1-septate conidia.

1. Significant difference of the rate of appearance by altering the concentration of the medium.

J_1(N/10)	J_2(N/5)	J_3(N/2)	J_4(N)	J_5(2N)	J_6(5N)	
60	72	92	88	76	54	
52	72	86	84	80	54	
48	84	94	84	74	56	
60	72	82	82	72	58	
56	78	80	84	72	64	Tolal
276	378	434	422	374	286	2170
T_1	T_2	T_3	T_4	T_5	T_6	T
5	5	5	5	5	5	30

$S_{RJ}=161938-156963.3=4974.7$

$S_J=160455-156963.3=3491.7$

$S_{R(J)}=4974.7-3491.7=1483.0$

Factor	SS	f	V
J	3491.7	5	693.34
R(J)	1483.0	24	61.79
R J	4974.7	29	

$F=698.34/61.79=11.30$

$F^{n_1}_{n_2}(0.05)$ from F-table=2.57, $n_1=5$, $n_2=24$.

Therefore, the significant difference of the rate of appearance has been recognized.

2. Significant difference of the rate of appearance in each concentration.

Conc.	Sample mean	No. of sample	u^2	F	$(\bar{x}-\bar{y})^2/w^2$	F_0	Judgement
N/10 N/5	55.2 75.6	5 5	27.2 28.8	$F<6.39$	14.86	37.15	+
N/5 N/2	75.6 86.8	5 5	28.8 37.2	$F<6.39$	3.80	9.5	+
N/2 N	86.8 84.4	5 5	37.2 4.8	$F=7.75$ >6.39*			
N 2N	84.4 74.8	5 5	4.8 10.7	$F<6.39$	13.96	34.9	+
2N 5N	74.8 57.2	5 5	10.7 17.2	$F<6.39$	22.21	55.53	+
N/10 5N	55.2 57.2	5 5	27.2 17.2	$F<6.39$	0.18	0.25	−

* N/2 and N do not belong to the same population.

Table. Ⅳ. The distribution of conidial size of 3- and 1-septate conidia produced under various coucentrations.

a. 3-septate conidia

conc. of the medium.	Scale in the micrometer*											
	17	18	19	20	21	22	23	24	25	26	27	mean
N/10				2		2	4	4	5	2	1	23.8
N/5		1	2	4	6	5		2				21.0
N/2	1	2	3	5	4	3		2				20.4
N		1	7	3	3	5			1			20.45
2N			3	1	4	5	6	1				21.65
5N				2	5	4	2	4	3			22.5

b. 1-septate conidia

Conc. of the medium.	Scale in the micrometer									
	11	12	13	14	15	16	17	18	19	mean
N/10			1	3	5	4	3	3	1	15.9
N/5	1		3	3	4	5	3	1		15.05
N/2		3	4	7	5	1				13.85
N		1	5	4	6	3	1			14.4
2N		4	1	2	8	3	2			14.55
5N			2	2	3	6	5	2		15.3

* These values multiplied by 1.4 make the sizes in micron.

Table. V. The Judgement (4) (5) of the significant difference.

a. 3-septa conidia.

1. Significant difference of the size of conidia by altering the concentration of the medium.

J_1(N/10)	J_2(N/5)	J_3(N/2)	J_4(N)	J_5(2N)	J_6(5N)	
24*	21	22	21	23	25	
20	21	21	19	24	25	
⋮	⋮	⋮	⋮	⋮	⋮	
27	19	21	19	23	24	
24	22	18	20	19	21	Total
476	420	408	409	433	450	2596
T_1	T_2	T_3	T_4	T_5	T_6	T
20	20	20	20	20	20	120

* Values expressed in scale number.

$$S_{RJ}=56660-56160=500$$

$$S_J=563335.5-56160=175.5$$

$$S_{R(J)}=500-175.5=324.5$$

Factor	SS	f	V
J	175.5	5	35.1
R(J)	324.5	114	2.85
R J	500	119	

$$F_o=35.1/2.85=12.34$$

$F^{n_1}_{n_2}(0.05)$ from F-table$=2.29$, $n_1=5$, $n_2=114$.

Therefore, the significant difference has been recognized.

2. Significant difference of the size of conidia in each concentration.

Conc.	Sample mean	No. of sample	u^2	F	$(\bar{x}-\bar{y})^2/w^2$	F_0	Judgement
N/10 N/5	23.8 21.0	20 20	3.43 2.31	$F<2.15$*	2.97	29.7	+**
N/5 N/2	21.0 20.4	20 20	2.31 3.41	$F<2.15$	0.13	1.26	−***
N 2N	20.45 21.65	20 20	2.89 2.13	$F<2.15$	0.81	8.1	+
2N 5N	21.65 22.5	20 20	2.13 2.79	$F<2.15$	0.29	2.88	−
N/10 5N	23.8 22.5	20 20	3.43 2.79	$F<2.15$	0.59	5.89	+

* The value obtained from F-table.

** Significant in 95% of confidence limit.

*** Not significant in 95% of confidence limit.

b 1-septate conidia.

1. Significant difference of the size of conidia by altering the concentration of the medium.

J_1(N/10)	J_2(N/5)	J_3(N/2)	J_4(N)	J_5(2N)	J_6(5N)	
18	18	12	14	15	16	
14	13	14	16	15	15	
⋮	⋮	⋮	⋮	⋮	⋮	
16	13	14	14	12	17	
15	17	12	13	14	17	Total
318	301	277	288	291	315	1790
T_1	T_2	T_3	T_4	T_5	T_6	T
20	20	20	20	20	20	120

$S_{RJ}=27017-26700.8=316.2$

$S_J=26765.2-26700.8=64.4$

$S_{R(J)}=316.2-64.4=251.8$

Factor	SS	f	V
J	64.4	5	12.88
R(J)	251.8	114	2.21
R J	316.2	119	

$F_0=12.88/2.21=5.83$

$F^{n_1}_{n_2}(0.05)$from F-table$=2.29$, $n_1=5$, $n_2=114$.

Therefore, the significant difference has been recognized.

2. Significant difference of the size of conidia in each concentration.

Conc.	Sample mean	No. of sample	u^2	F	$(\bar{x}-\bar{y})^2/w^2$	F_0	Judgement
N/10 N/5	15.9 15.05	20 20	2.62 2.73	$F<2.15$	0.27	2.7	−
N/5 N/2	15.05 13.85	20 20	2.73 1.29	$F<2.15$	0.72	7.2	+
N/2 2N	13.85 14.55	20 20	1.29 2.58	$F<2.15$	0.25	2.5	−
2N 5N	14.55 15.75	20 20	2.58 2.30	$F<2.15$	0.59	5.9	+

Tadle. Ⅶ. The description of the shape of conidia appeared under various concentrations.

Conc. of the medium	Shape of conidia
N/10 & N/5	Shape of conidia normal, straight or slightly curved, truncate or rounded at the end; slight protrusion appeared at the septa; nature of the content granulate.
N/2	Shape of conidia somewhat curved; width of them becomes narrower.
N	Irregular shape of conidia, i. e., swelling in a part of some of them appeared.
2N & 5N	Curvature of conidia a little; swelling tendencies increased.

Fig. 1. Variations of the rate of appearance of 3-, 2-and 1-septate Conidia appeared by altering the concentration of the medium.

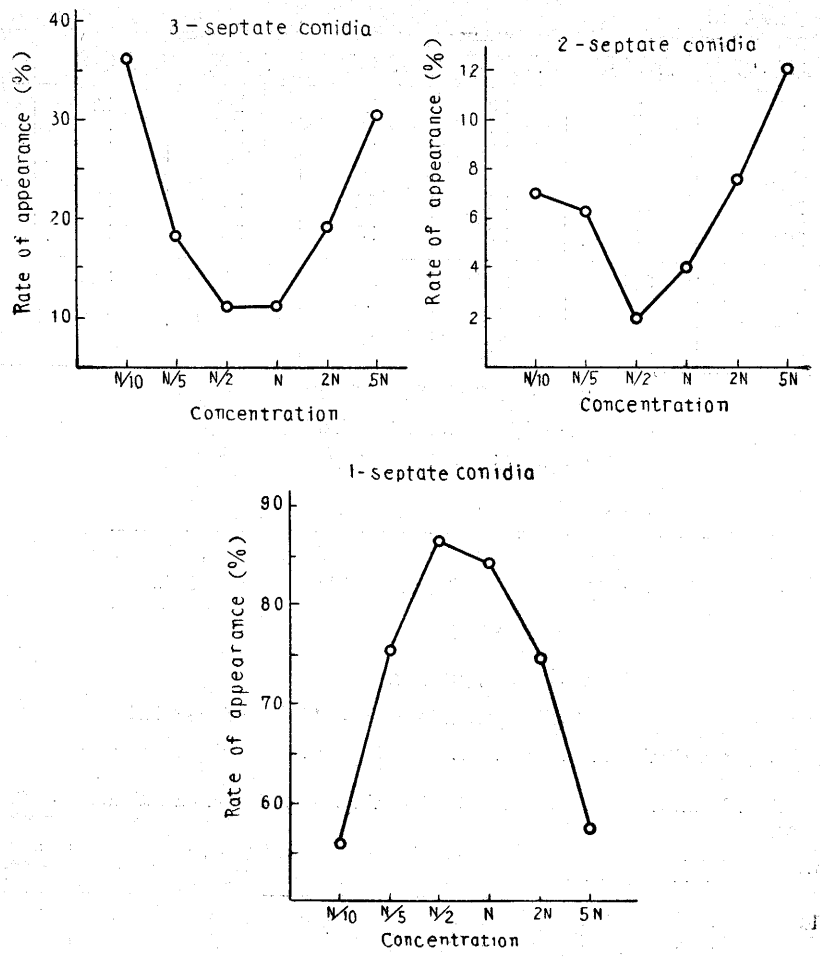
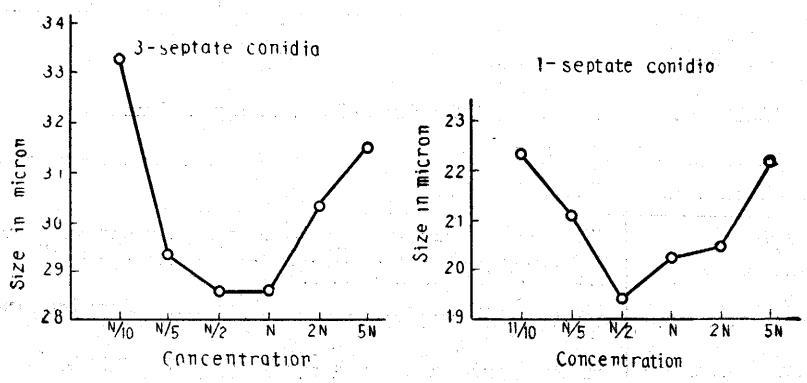


Fig. 2. Variations of the size of 3- and 1- septate conidia appeared by altering the concentration of the medium.



Discussion

The fact that *Fusarium solani*, growing on the medium of each concentration, shows different growth forms to each other according to the change of the concentration of the medium is obvious as shown in Tadle I. At N/10 and N/5, the mycelial mats are thin and the aerial mycelia are scanty. At N/2-5N, the mycelial mats of fungous colonies are thick, and the aerial mycelia are produced abundantly, and the coloration arises frequently under the surface of the mycelial mats. Sometimes, sectors or irregular mycelial growth forms appear. The colorations of sectors are yellow to dark brown and they tend to be conspicuous in accordance with the increase of the cencentration. So there are considerable differences among the growth forms of the fungous colonies grown in each concentration.

Though considerable differences were recognized in the thickness of the mycelial mats and the volume of the aerial mycelia between lower and higher concentrations, the difference in the velocity of the extension of fungous colonies could not be recegnized.

As shown in Table II and Figure I, the variation of the rate of appearance of 3-, 2- and 1-septate conidia, that is regarded as one of the physiological responses of this fungus to the variation of the concentration of the medium, were presented very clearly. That is, in the range from N/10 to 5N, the rate of appearance of 1-septate conidia shows always over 50 per cent and the rest (below 50 per cent) is shared by that of 3- and 2-septate conidia. But the rate of appearance of the three-kind septate conidia differs respectively by altering the concentration and that of 3- and 2-septate conidia shows the minimum value at N/2. On the contrary, that of 1-septate conidia shows the maximum value at that concentration.

In lower and higher concentrations than N/2, the rate of appearance of 3- and 2-septate conidia becomes larger and that of 1-septate conidia becomes smaller, than the value appeared at N/2.

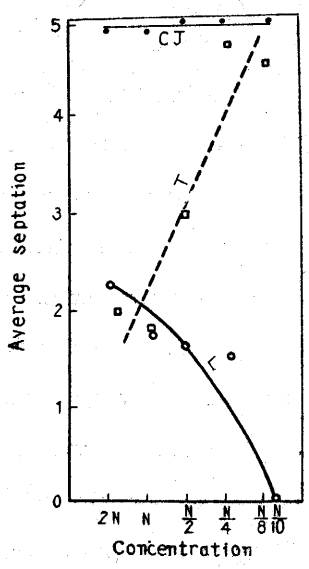
The rate of appearance of 3- and 2-septate conidia becomes smaller in accordance with the increase of the concentration in the range of N/10-N/2, and then it begins conversely to be larger in the concentration from N/2 to 5N. On the contrary, the rate of appearance of 1-septate conidia shows the reverse tendency

of that of 3- and 2-septate conidia. Thus, both the minimum value of the rate of appearance of 3- and 2-septate conidia and the maximum value of that of 1-septate conidia appeared at N/2. Therefore, it may safely be pointed out that the N/2 is the important concentration affecting the conidial septation of this fungus.

Regarding to the conidial septation, HORNE and MITTER (3) stated as follows: "It was found that low septation is produced by high concentration of the nitrogen-containing constituent of the nutrient medium, by the presence of unduly high concentration of acid and alkali and other factors." On the other hand, BROWN and HORNE (2) said that both the degree of septation of conidia and the nature of their contents of *Fusarium* strains could be modified by altering the concentration of constituents of the medium.

In the former, 12 strains belonging to section *Discolor* and to another section were used, and these strains showed separate responses regarding to the degree of septation by altering the cultural conditions continuously, with special reference to the asparagine and glucose as the constituents of the medium, respectively. As shown in Figure Ⅲ, the strain T showed a high average septation, the strain CJ showed no response, etc., in accordance with the decrease of the concentration of the constituents of the medium.

Fig. 3. Graph showing average septation curves for the strain CJ, T, and L. (HORNE and MITTER)



The results above mentioned and those obtained by the writer are no more than the record produced by altering the concentration in the conidial septation as one of the responses in the physiology of this fungus.

The clue make clear what kind of a mechanism will affect upon the fungous physiology, changing the concentration of the medium, can hardly be obtained from these experimental results. Only it can be said here that the results obtained in the present experiments are the description of the phenomenon of the conidial

septation appeared as one of the physiological characteristics of *Fusarium solani* to the change of the concentration of the medium and that N/2 is the concentration influencing conspicuously upon the conidial septation of this fungus.

The studies regarding to the variation of the size of conidia influenced by the change of cultural conditions are nearly nothing up to the present time.

The tendency obtained by the writer regarding to the size of cenidia was similar with that regarding to the rate of appearance of 3-septate conidia except that of 1-septate conidia previously mentioned, namely, the maximum value of the size of 3-septate conidia appeared at N/10, then decreased and at N/2 the size of 3-septate conidia gave the smallest value, then increased conversely in accordance with the increase of the concentration of the medium. The interesting fact obtained in the present studies is that the variation of both the rate of appearance and the size of 3-septate conidia coincided fairly towards the variation of the concentration of the medium. The rate of appearance and the size of 3-septate conidia had the same values at N/2 and N, respectively, and the tendencies of the variation of these values, appeared towards the change of the concentration, nearly agreed with each other.

On the other hand, the tendency of the rate of appearance and the size of 1-septate conidia showed a reverse relation, that is, the maximum value of the fermer appeared at N/2, and the minimum value of the latter also appeared at that concentration.

Since the size of conidia became maximum when the concentration was at N/10 and then it decreased in accordance with the increase of the concentration, it may be considered that the size of conidia will show the smallest value at 5N. In fact, however, the smallest value of the size of conidia appeared between N/2 and N.

Since it has been recognized that the fungous reaction tends to sporulate by pursuing starvation culture, supporsing that the cultural conditions may become a sort of starved conditions in high concentrations such as 2N and 5N by the fact that the concentration of water becomes less towards such high concentration of constituents, it may be able to explain the results that nearly the same values in the size of conidia at N/10 and 5N were obtained, though the biochemical action

to the physiology of this fungus may surely be different between N/10 and 5N. However, this is no more than an estimation and is expected to future investigation regarding to these phenomena above mentioned.

However, it may be unable to overlook that there may exist a close relation between the rate of appearance of septate conidia and the size of them, and that the size of both 3- and 1-septate conidia has shown the minimum value at N/2.

In addition, the writer suggested the importance of proper balance between carbon and nitrogen sources upon the conidial formation of this fungus in his previous paper, according to the fact that the normal conidial formation was hindered from high concentration when glucose and asparagine were used separately as the carbon and the nitrogen sources of the medium. As shown in the results in this experiment, so far as the balance in the composition of the medium is keeping, it is clear that the conidial formation of this fungus is hardly hindered, even when the concentration of the medium reaches considerably high such as 5N.

Besides, as clarified in Table Ⅲ and Table Ⅴ, significant differences of the rate of appearance and of the size of both 3- and 1-septate conidia in some concentrations, were judged. Consequently, it may be estimable that the change of the concentration of the medium will influence considerably upon the conidial characteristics.

Though the similar tendency between the rate of appearance and the size of 3- and 1-septate conidia, produced in lower and higher concentrations, can be seen, the fact that the differences of the concentration of the medium have different actions upon the fungous development, was shown clearly in the variation of the shape of conidia appeared in the two extreme concentrations such as N/10 and 5N. Namely, among the shape of conidia produced between lower and higher concentrations, considerable differences were seen. That is, the shape of conidia produced in N/10-N/2 was normal and showed so called "sickel shape", and they were stainable by ruthenium red. The nature of their contents was granular. When the concentration reached N-5N, particularly 2N and 5N, a part of conidia swelled frequently. Consequently, they presented an abnormal shape. This tendency of swelling increased in accordance with the increase of the concentration. The swe-

lling part was stained slightly or almost unstainable by ruthenium red, and their contents were somewhat reticulate.

Though it is clarified that the change of the concentration of the medium influences te considerable extents upon the conidial characteristics of *Fusarium solani*, the variation of the conidial characteristics is a mere phenomenon appeared as one of the responses of this fungus towards the change of the concentration of the medium. Biochemical actions of the concentration of the medium upon the physiology of this fungus remain unexplained.

Summary

1. The considerable differences in growth forms of ***Fusarium solani*** appeared by altering continuously the concentration of the medium from N/10 to 5N. But there is almost no difference among the velocity of the growth in radial direction of the fungous colonies.

2. The rate of appearance of 3-, 2- and 1-septate conidia varied conspicuously accordimg to the change of the concentration of the medium. That of 3-and 2-septate conidia showed the smallest value and that of 1-septate conidia the largest at N/2.

3. It seems to exist a close relation between the variation of the rate of appearance and that of the size of them. At N/2, the size of 3- and 1-septate conidia shows the smallest value. The variation of the rate of appearance and that of the shape of 3-septate conidia nearly coincide with each other. That of 1-septate conidia shows fairly reverse tendency to the case of 3-septate conidia.

4. The difference among the shape of conidia, appeared under various concentrations of the medium, was recognized clearly. That is, the shape of conidia produced in low concentrations, was normal and showed so called "sickel shape". But, in higher concentrations, a part of conidia frequently swelled and the shape of them became abnormal. It is sure that a sort of variations in the nature of the content of these swollen parts are produced, according to the fact that these swollen parts are difficult to stain by ruthenium red.

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フザリウム・ソラニ菌の分生胞子の性質に及ぼす培養条件に就て

(摘　要)

(第Ⅱ報) 培地の濃度に就て

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菌類を人工培養する場合，数多くの培養条件が考へられるが，それらの一つとして，培地の濃度が *Fusarium solani* の分生胞子の性質，特に隔膜の形成，大さ，形等にどの様な影響を及すかといふ事に主眼をおいて研究を行つた。換言すれば本研究は培地の濃度の変化に対して，本菌がどの様な形態学的反応を示すかといふ事に就いて行はれたものである。

培養基は，第一報に述べた如く Brown の "synhetic potats dextrose" agar を用ひ，その濃度を標準と見做してNで表はすことゝし，N/10, N/5, N/2, N, 2N, 5N の六段階の濃度を有する Brown の培養基を実験に用ひた。例へば N/10 は寒天以外の成分の使用量は N の場合の 1/10 になつている事を示す。寒天だけは総ての場合 2% の割合で使用した。

之等六区の培養基に純粋培養した *Fusarium solani* を接種して 23°C に保ち，20 日後に分生胞子に就て種々の観察測定を行つた。以下簡単にその結果を述べる。

1. 菌叢の状態

低濃度と高濃度の培地に発育した菌叢の状態の間には著しい相違が見られる。N/10 乃至 N/5 の低濃度の培地に発育した場合には，菌叢は著しく薄く，空中菌絲の量も極めて少い。之に反して N/2 乃至 5N 特に 2N 及び 5N の高濃度培地に発育した場合には，菌叢は著しく厚くなり空中菌絲も多量に形成され，菌叢の裏面に黄色乃至暗褐色の着色が生じ，又時に sector が生ずる事がある。

2. 3-, 2-, 1- Septate conidia の出現率の変化

一定数の分生胞子中に含まれる 3-, 2-, 1- Septate conidia の割合は，培地の濃度を変へる事によつて，著しく変化する。本研究では，50 ケの分生胞子に含まれる表記三種の数の違つた Septa（隔膜）を有する分生胞子の割合を百分率で表し，出現率（the rate of appearance）とした。測定は 5 回繰返して行つた。その結果 3- Septate conidia と 2- Septate conidia の出現率は N/2 の濃度で最小値を示し，1- Scptate conidia のそれは，逆に最大値を示した。N/10 から N/2 迄は前者は減少し後者は増大する事から，更に高濃度培地に於ても，この傾向が続くであらうと思はれたが，実際には N/2 で出現率の傾向が逆になる事が知られた。

低濃度と高濃度の培地とでは本菌の生理に対する作用が異るであらうが，詳細は不明である。

3. 3-, 1- Septate conidia の大さの変化

2- Septate conidia は，その性質が 3-, 1- 両 Septate conidia の中間的性質を有するので測定しなかつた。3- Septate conidia の大さの変化の仕方は出現率の変化の仕方と極めてよく一致し，比の場合も N/2 の濃度で，最小値を示す。1- Septate conidia の大さの変化も N/2 で最小値を示し，出現率の場合とは全く逆の傾向を示した。こゝで重要な事は，出現率と大さとの間には密接な関係が存在するらしい事が，両者の変化の傾向からうかゞはれる事である。

斯の如く，N/2 の濃度は本菌の分生胞子の隔膜の形成及びその大さにとつて，極めて重要な濃度であると考へられる。

4. 分生胞子の形の変化

N/10 乃至 N/2 程度の低濃度培地に形成された分生胞子の形は，所謂鎌形で，正常な形を示す。併し高濃度，特に 2N, 5N の培地に生じた分生胞子の中には，その一部が膨大して特異な形を有するものが生じ，この膨大した部分は，ruthenium red に染まり難く，又内容は幾分網目状を呈する事等から，質的な変化が膨大部に起つている事がうかがはれる。

以上述べた如く，低濃度と高濃度の出現率と大さに関する影響は N/2 の濃度を中心として略々同じ様な結果となつて現れるが，分生胞子の形に及す影響は著しく異ることが明かとなつた。即ち，本菌の生理に及す培地の濃度の高低は質的に夫々異つた作用を有するものと考へられる。上述の実験結果は，その作用に対する菌の反応が出現率大さ及び，形の変化を通じて現れたものに過ぎず，菌の生理に及す作用の mechanism は未だ不明であり，今後の研究に俟つ所大であると考へられる。

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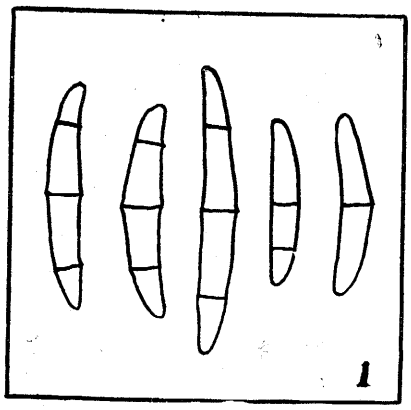
Explanation of Plate Ⅳ

1. Conidia produced on the medium of the concentration of N/10. The shape of them is normal and shows so called "sickel shape".
2. Conidia at N/5.

3. Conidia at N/2.
4. Conidia at N. The swelling of a part of conidia begidia begins to appear.
5. Conidia at 2N.
6. Conidia at 5N. The tendency of swelling begins to increase.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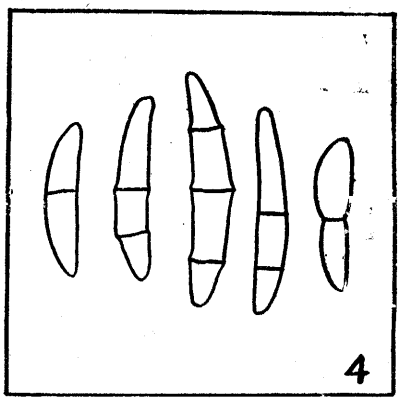
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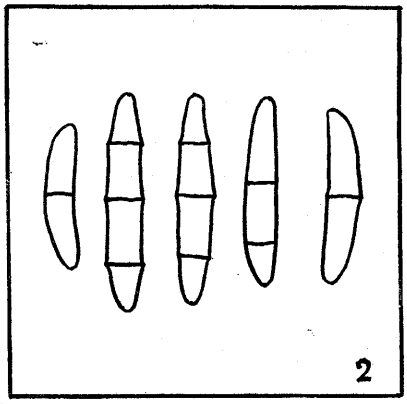
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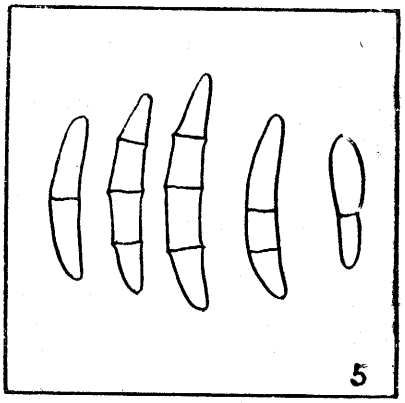
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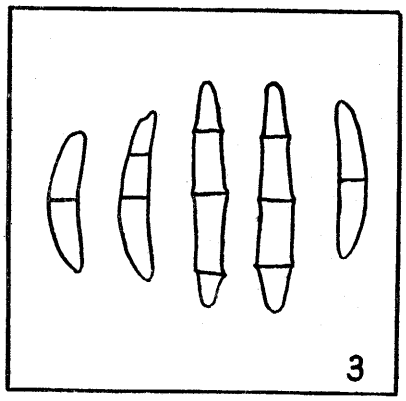
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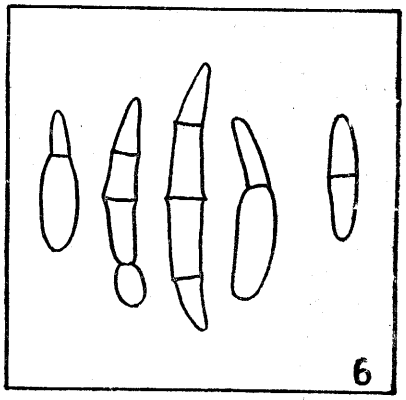
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