SPORE-SIZE VARIABILITY IN SUBSEQUENT SPORE PRINTS OF SOME HYMENOMYCETOUS FUNGI

BY

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Spore size constitutes an important criterion for distinguishing the species of almost all fungi, and in turn the non-coincidence of spore measurements may often lead the investigators to divergent opinions as to classification. As to the variability owing to environment, maturity, etc., there are many data accumulating in mycological and phytopathological literature. But, as far as the writers could ascertain, no reports which demonstrate spore variability of hymenomycetous fungi caused by the repetition of spore printing with the same pileus have been published except that of ZELLER and the senior writer of this paper (ZELLER, S. M. and TOGASHI, K.: The American and Japanese Matsu-takes. Now in press). After having made biometric studies they pointed out that the spores of *Armillaria Matsutake* ITO et IMAI become somewhat smaller and rounder in the later spore prints, and also that the range of variability of spore sizes becomes narrower. It is the object of this paper to inquire whether this tendency in spore sizes may occur in the other cases of hymenomycetous fungi outside *A. Matsutake*.

For the purpose of this study fresh materials of the following hymenomycetous fungi were selected; namely *Armillaria mellea* (VAHL.) FR., *Hypholoma sublateritium* SCHAEFF., *Pholiota adiposa* FR. and *Collybia velutipes* (CURT.) FR.

As usual in getting spore prints, a fully developed pileus from which the stem had been removed was placed with the gills downward on a sheet of paper and was covered with a bell glass to keep the air from blowing the spores away. Just one day later the covering and the pileus were removed. Thus, from the same pileus four spore prints, one per day, were obtained at the regular times, and the spores from the print were used for measurements being mounted in water drops on a glass slide. In measuring the spores biometric constants were calculated by the assumed mean method. The formulae used were the same as in the case of *Armillaria Matsutake*.

The results of the measurements will be shown in the accompanying tables.

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Table 1. Biometric data on the length and width of each 100 spores from the same pileus of *Armillaria mellea*

Length in microns										
Spore print	5	6	7	8	9	10	Total	Mean	Standard deviation	Coefficient of variability
1st		14	27	46	11	2	100	7.60±0.06	0.92±0.04	12.20±0.58
2nd	1	46	35	18			100	6.70±0.05	0.76±0.03	11.46±0.54
3rd		42	45	13			100	6.71±0.04	0.68±0.03	9.87±0.47
4th		50	37	13			100	6.63±0.04	0.70±0.03	10.59±0.50

Width in microns								
Spore print	3	4	5	6	Total	Mean	Standard deviation	Coefficient of variability
1st	1	39	59	1	100	4.60±0.03	0.52±0.02	11.33±0.53
2nd		89	11		100	4.11±0.02	0.31±0.01	7.61±0.36
3rd		97	3		100	4.03±0.01	0.17±0.01	4.23±0.20
4th		98	2		100	4.02±0.01	0.14±0.01	3.48±0.16

Table 2. Biometric data on the length and width of each 100 spores from the same pileus of *Pholiota adiposa*

Length in microns									
Spore print	6	7	8	9	10	Total	Mean	Standard deviation	Coefficient of variability
1st	12	33	50	4	1	100	7.48±0.05	0.78±0.04	10.52±0.50
2nd	54	43	3			100	6.49±0.04	0.55±0.03	8.57±0.41
3rd	55	42	3			100	6.48±0.04	0.55±0.03	8.58±0.41
4th	64	34	2			100	6.38±0.04	0.52±0.03	8.22±0.39

Width in microns						
Spore print	4	5	6	Total	Mean	Standard deviation	Coefficient of variability
1st	44	53	3	100	4.59±0.04	0.54±0.03	11.97±0.57
2nd	100			100			
3rd	100			100			
4th	100			100			

Table 3. Biometric data on the length and width of each 100 spores from the same pileus of *Hypholoma sublateritium*

Length in microns								
Spore print	3	4	5	6	Total	Mean	Standard deviation	Coefficient of variability
1st	3	13	64	20	100	5.01±0.04	0.67±0.03	13.38±0.63
2nd	4	18	57	21	100	4.95±0.04	0.73±0.03	14.94±0.71
3rd	4	19	64	13	100	4.86±0.04	0.68±0.03	14.11±0.67
4th	5	20	67	8	100	4.78±0.04	0.65±0.03	13.74±0.65
Width in microns								
Spore print	3		4		Total	Mean	Standard deviation	Coefficient of variability
1st	71		29		100	3.29±0.03	0.45±0.02	13.79±0.65
2nd	79		21		100	3.21±0.03	0.40±0.02	12.68±0.60
3rd	84		16		100	3.16±0.02	0.37±0.02	11.60±0.55
4th	86		14		100	3.14±0.02	0.35±0.02	11.02±0.52

Table 4. Biometric data on the length and width of each 100 spores from the same pileus of *Collybia velutipes*

Length in microns								
Spore print	5	6	7	8	Total	Mean	Standard deviation	Coefficient of variability
1st	15	54	28	3	100	6.19±0.05	0.71±0.03	11.58±0.55
2nd	22	54	23	1	100	6.03±0.05	0.70±0.03	11.59±0.55
3rd	14	63	21	2	100	6.11±0.04	0.64±0.03	10.58±0.50
4th	9	57	27	7	100	6.32±0.05	0.73±0.03	11.60±0.55
Width in microns								
Spore print	2		3		Total	Mean	Standard deviation	Coefficient of variability
1st	70		30		100	2.30±0.03	0.45±0.02	19.92±0.95
2nd	79		21		100	2.21±0.03	0.40±0.19	18.42±0.88
3rd	75		25		100	2.25±0.03	0.43±0.02	19.24±0.92
4th	83		17		100	2.17±0.03	0.37±0.03	17.31±0.83

Table. 5. Biometric data on the length and width of each 100 spores from the same pileus of *Collybia velutipes* (cultured)

Length in microns								
Spore print	5	6	7	8	Total	Mean	Standard deviation	Coefficient of variability
1st	7	59	25	9	100	6.36±0.05	0.74±0.04	11.66±0.56
2nd	16	49	29	6	100	6.25±0.05	0.79±0.04	12.67±0.60
3rd	16	51	28	5	100	6.22±0.05	0.76±0.04	12.36±0.59
4th	7	55	30	8	100	6.39±0.05	0.73±0.03	11.47±0.55
Width in microns								
Spore print	2		3		Total	Mean	Standard deviation	Coefficient of variability
1st	82		18		100	2.18±0.03	0.38±0.02	17.62±0.84
2nd	72		28		100	2.28±0.03	0.44±0.02	19.69±0.94
3rd	82		18		100	2.18±0.03	0.38±0.02	17.62±0.84
4th	85		15		100	2.15±0.02	0.35±0.02	16.60±0.79

As already mentioned in the case of *Armillaria Matsutake* the spore dimensions, especially the length, of the four fungi used become smaller and consequently the spores become rounder in shape with the repetitions of spore printing with the same pileus. In *Collybia velutipes*, however, this tendency was not so conspicuous and even in some instances the spores were slightly greater in length or in width (Tables 4 and 5). The most striking decrease in spore dimensions was observed in *Pholiota adiposa* showing an extreme difference between the means calculated on the spores from the first and fourth prints of 1.10 μ in length and 0.58 μ in width (Table 2). In the cases of *Armillaria mellea* and *Hypholoma sublateritium* the extreme differences of length and width were 0.97 μ and 0.58 μ (Table 1), and 0.23 μ and 0.15 μ (Table 3), respectively. It is of interest and also noteworthy that in the two cases, of *Pholiota adiposa* and *Armillaria mellea*, the spores from the second print showed an abrupt decrease in dimensions compared with those from the first print and after that a gradual decrease took place. One more interesting fact is that in the subsequent spore prints of the four fungi the variability of spore dimensions, both in length and width, became considerably narrower and the mode of spore classes removed to the lower side, with the one exception of *Collybia velutipes*.

In conclusion the writers can infer with certainty that in hymenomycetous fungi, at least in those that produce ellipsoidal or similar shaped spores, the

spores are apt to show somewhat smaller and rounder in size and shape when they are examined one or more days after the fungi are collected, since the fungi may dischage the spores continuously and freely as long as the pilei do not dry out or rot. Investigators should bear in mind these facts if they try to identify a fungus of this group.

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STUDIES ON THE DOWNY MILDEWS OF CRUCIFEROUS VEGETABLES IN JAPAN I

BY

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Many kinds of cruciferous vegetables useful to the daily life of the Japanese are widely cultivated throughout the territory of Japan. Most of them belong to the genus *Brassica* or *Raphanus*, and are commonly subject to the attack of a *Peronospora* fungus known formerly as *Peronospora parasitica* (PERS.) FR., but lately often designated as *Peronospora brassicae* GM.

It seems to be inferable from the recent investigation of GÄUMANN[3] that the fungus parasitic on these cruciferous vegetables might comprise various strains different in pathogenicity. To ascertain this assumption, some inoculation experiments have been carried out, and the results so far obtained are tentatively presented in this paper.

Materials and Methods

Affected leaves of various cruciferous vegetables found in the neighbourhood of Gifu Agricultural College were collected, as a rule, towards evening, washed in running water, and each kept in a moist satchel in the laboratory. In this way, an abundance of fresh conidia were easily available on the following morning. The seeds used in these experiments were all gotten at a seed store in Gifu. They were sown and grown in ordinary porcelain pots.

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