POSTHARVEST DISEASE CONTROL OF VANILLA (VANILLA PLANIFOLIA ANDREWS) BY CONTROL ATMOSPHERE

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Abstrak

Tujuan penelitian ini untuk mengetahui macam-macam jamur yang menyerang buah panili dan bagaimanakah pengaruh suhu dan kelembaban relatif terhadap pertumbuhannya.

Penelitian ini dilaksanakan dengan inventarisasi jamur-jamur yang dapat diisolasi dari buah panili sakit dengan jalan isolasi dan identifikasi. Kandungan vanillin dianalisis dengan metode spectrofotometer, sedang pertumbuhan linier jamur dilaksanakan dengan media PDA pada suhu yang berbeda-beda dan dengan media buah panili pada kelembaban relatif yang berbeda-beda.

Inventarisasi jamur dari buah panili sakit menghasilkan *Aspergillus* spp., *Penicillium* sp., *Rhizopus* sp. dan *Sclerotium* sp.

Analisis kandungan vanilin menunjukkan bahwa jamur mengurangi kandungan vanillin, meskipun masing-masing jamur berbeda kemampuan menurunkannya. Jamur yang tumbuhnya cepat mempunyai kemampuan menurunkan kandungan vanillin lebih besar dari jamur yang tumbuhnya lambat.

Pada umumnya pertumbuhan koloni jamur dihambat oleh suhu rendah (15°C) dan suhu tinggi (40°C), kecuali *Rhizopus* sp. karena jamur ini adalah salah satu anggota jamur termofilik. (Oso, 1979). Di samping itu pertumbuhan koloni jamur juga dihambat oleh kelembaban relatif rendah (50%) dan biasanya makin rendah kelembaban relatif makin besar kemampuan penghambatannya.

Berdasarkan atas data tersebut buah panili seharusnya disimpan pada suhu rendah dan kelembaban relatif rendah untuk mencegah perusakan oleh jamur-jamur yang timbul pada periode lepas panen.

Abstract

The aim of these experiments are to find out kinds of fungi attacked vanilla pod and what are the influences of temperature and relative humidity on their growth.

These experiments are carried out by isolation and identification to invest of isolated fungi. Vanillin content will be analysed by spectrophotometric method, while colony growing fungus will be carried out on PDA at different temperatures and on vanilla pod medium at different relative humidities.

Inventarization fungi from vanilla pod produce *Aspergillus* spp., *Penicillium* sp., *Rhizopus* sp. and *Sclerotium* sp.

Analysis of vanillin content showed that fungi reduce vanillin content, although each fungus is differ in its reduction capability. Faster growing fungi have a greater reduction than the slower one.

Generally fungi growth are inhibited by low temperature (15°C) and high one (40°C) except *Rhizopus* sp., because it is one of the member of thermophilic fungi (Oso, 1979). Besides that fungus growth can also be inhibited by low relative humidity (50%) and usually the lower relative humidity the slower fungus growth is.

Base on these data vanilla pod should be stored at low temperature and relative humidity to control its deterioration by storage fungi.

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INTRODUCTION

Vanilla fruit is one of the important export comodities since World War II (Denium **cit.** Dirdjopranoto & Soenoeadji, 1978), but recently Indonesian export is very low either the quality or the quantity. It is caused by some factors, e.g. :

1. Vanilla fruit is considered as a green gold, so that there are many people to steal it. They want to get profitable from planting vanilla, but they do not want to do it theirself.
2. The effect of the stealing, vanilla fruit is picked before the time. This is done in order to be able to pick his vanilla fruit before it is stolen.
3. There is no weeding and let the weed grows until to cover his vanilla fruit. The stealing will be eliminated by disappearing the vanilla fruit.
4. Without any weeding caused the increasing of grove relative humidity and stimulate stem foot rot fungus, **Fusarium batatatis** var. **vanillae.**
5. Besides attacks the stem the fungus also attacks the fruit and causes fruit rot or at least to make wounded fruit.
6. The wounded fruit is very favourable for postharvest fungi penetration.

The magnitude of postharvest looses had been stated in many refferences (Martoredjo, 1979).

Before World War II vanilla planting areas in Java are Garut, Temanggung and Malang, and then spread to Ambarawa, Salatiga, Kedu, Purworedjo and Kulonprogo.

Vanilla is a good growing at area where the rainfall is medium. The rainfall is homogenously spread in ten months every year and the rest two months are relatively dry (Dirjopranoto & Soenoeadji, 1978).

The best quality of vanilla fruit can be obtained by picking at a certain mature stage, where the tip of the fruit becomes yellow and yellow stripes appear on throughout the fruit surface.

Vanilla fruit is forced to be picked before the time, because the stealing or the occuring of foot rot disease. This event cause decreasing of quality and quantity, because either the size or the vanilla formation have not completely yet. Besides that, **Fusarium** attacking may cause deterioration of vanillin content.

There is not information yet about how much the magnitude loss and how the mechanism of vanillin deterioration are, particularly how to control the disease.

In this paper is tried to inform what is the magnitude of loss and to control it by control atmosphere, in this case by using different temperatures and relative humidities of storage room, because the use of fungicide may be have a side effect.

Material and Method

This experiment consists of some stages, e.g.:

A. Inventarisation of fungal pathogens by
   1. fungal isolation of infected vanilla fruit using PDA
   2. identification of fungi by description method using refferences Raper & Thom (1968) and Raper & Fennel (1977).

B. Vanillin deterioration is detected by spectrophotometric method of AOAC (1970).

C. The influence of temperature on linear fungal growth is carried out by growing fungi on PDA medium at different temperatures. In this case uses 15°C, 20°C, room temperature (28° — 30°C), 35°C and 40°C.

D. The influence of relative humidity on linear fungal growth is carried out by growing fungi on vanilla fruit medium at different relative humidities. In this case uses 50%, room relative humidity (61.7% — 71.7%) and 85%. Relative humidity of 50% is adjusted by using chalk (CaO) in the room where the vanilla fruit medium is stored and 85% by using wet cotton wool.

Result

A. Inventarisation of fungi produce **Aspergillus niger, A. glaucus. A. flavus, Penicillium** sp., **Rhizopus** sp. and **Sclerotium** sp.

B. Before vanillin detection of infected fruit by spectrophotometric method, graphic standard of vanillin content and transmission value relationship should be created first. Their relationship can be seen in table 1 and in the figure. The equation of the graphic standard is $Y = -8.20X + 83.866$. Since there are some transmission values of infected fruit more than 83.866 so the vanillin content of those sample are nil. These data can be analysed statistically if they are transformed into $\sqrt{X + \frac{1}{2}}$. The transformed data can be seen in table 3, while the original data can be seen in table 2.

Table 1. **Vanillin content and transmission value relationship**

Vanillin content in %	Transmission value in %
0.5	87
1.0	76
1.5	69
2.0	64
2.5	61
3.0	56
3.5	53
4.0	51
4.5	49
5.0	47

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Figure Graphic standard of Vanillin content and transmission value relationship

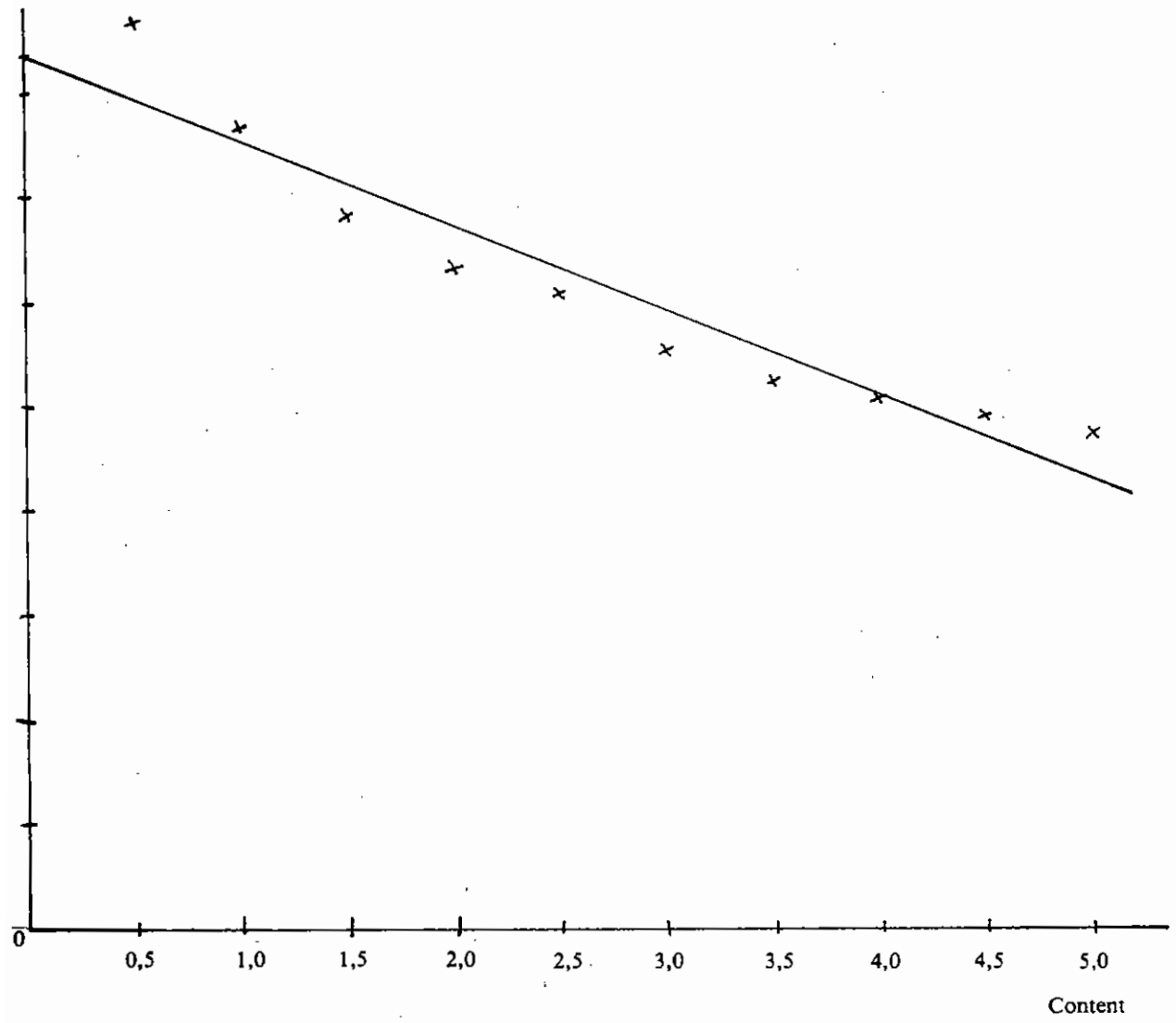

Table 2. **The original data of the relationship between kind of fungus, transmission value and vanillin content of infected vanilla fruit**

Fungus	transmission value			vanillin content (%)		
	1	2	3	1	2	3 *
Control	56	53	57.5	2.20	2.50	2.10
A. niger	76	88	83	0.66	0.00	0.10
A. flavus	83	87	81	0.10	0.00	0,20
A. Glaucus	70	61.5	67	1.10	1.70	1.30
Penicillium sp.	72	65	79	0.90	1.50	0.30
Rhizopus sp.	81	89	85	0.20	0.00	0.00
Sclerotium sp	78	89	86	0.40	0.00	0.00

* *replication*

Table 3. **The relationship of transformed data of vanillin content into $\sqrt{x} + \overline{1/2}$ and kind of fungus**

replication	transformed data of vanillin content of infected vanilla fruit attacks by						
	K	AN	AF	AG	P	R	Sc. *)
1	1.643	1.077	0.774	1.264	1.183	0.836	0.948
2	1.732	0.707	0.707	1.483	1.412	0.707	0.707
3	1.612	0.774	0.836	1.341	0.894	0.707	0.707
average	1.662	0.852	0.772	1.362	1.163	0.750	0.787

LSD = 0.0274.

*) K = control, AN = *Aspergillus niger*, AF = *A. flavus*, AG = *A. glaucus*, P = *Penicillium sp.*, R = *Rhizopus sp.* Sc = *Sclerotium sp.*

C. The influence of temperature on linear growth of fungsi on Potato Dextrose Agar (PDA) can be seen in table 4.

Table 4. **The influence of temperature on linear growth of fungi on PDA medium**

kind of fungus	the average of fungal colony diameter (mm) which grows at temperature of					LSD 0,05
	15°C	20°C	28°C-30°C	35°C	40°C	
AN	5.00	5.00	82.75	77.87	5.00	10.139
AF	5.00	5.00	52.62	49.25	5.00	17.720
AG	5.00	5.00	21.00	13.35	5.00	1.003
P	5.00	5.00	15.00	18.37	5.00	0.740
R	90.00	90.00	90.00	90.00	90.00	0.000
Sc	5.00	51.00	90.00	90.00	62.00	12.183

Data above show that generally linear growth of fungus stop or slower at low temperature (15°C) or high one (40°C) than at room temperature (28°C-30°C), except *Rhizopus* sp.

D. The influence of relative humidity on linear growth of fungi on vanilla fruit medium can be seen in table 5.

Table 5. **The influence of relative humidity on linear growth of fungi on vanilla fruit medium**

kind of fungus	the average of fungal colony diameter (mm) which grows at relative humidity of			LSD 0.05
	85%	61.7% - 71.7%	50%	
AN	28.16	27.33	9.50	18.920
AF	36.00	6.16	5.00	4.382
AG	23.16	17.50	5.00	7.703
P	8.82	5.00	5.00	0.889
R	75.16	71.66	5.00	42.067
Sc	18.00	13.83	5.00	0.889

Data above show that generally linear growth of fungus at 50% relative humidity in slower than higher one, either at room relative humidity (61.7% - 71.7%) or at 85%.

Discussion and Conclusion

Inventarization fungi of infected vanilla fruit produce **Aspergillus** spp., **Penicilium** sp., **Rhizopus** sp. and **Sclerotium** sp. while Kenaga (1974) stated that fungi which often found on postharvest period were **Aspergillus** sp., **Penicillium** sp. and **Rhizopus** sp.

Vanillin content of infected fruit (1.366% — 0.066%) much lower and significant different than the healthy one (2.266%). Kapti Rahayu **et al.** (1979) stated that compounds, which formed vanillin in fruit tissue, were destructed by enzym, which is produced by fungus, even the fruit tissue itself was also destructed, so that it was very easy to be separated (Wolf & Wolf, 1947).

Generally linear growth of fungi are slower at low temperature (15°C) and high one (40°C) than at room temperature (28°C-30°C), except **Rhizopus** sp., because it is one of the member of thermophilic fungi, so that very tolerant to low temperature and high one (Oso, 1979). Stakman and Harrar

(1957) stated that this fungus at low temperature grew quickly although it did not produce spores.

Linear growth of fungus at low relative humidity (50%) is stop or much slower than at the high one.

Base on those data above we conclude that vanilla fruit should be stored at low temperature and low relative humidity to control postharvest fungi.

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