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No. : 13/PTN/SEAPPRO/2019 24 July 2019
Appendix : -
Regarding : Letter of Acceptance

Dear Suwandi
Sriwijaya University

We are pleased to inform you that your paper based on your abstract entitled *"**Protection of Chili Pepper from mosaic virus disease and Aphis gossypii by a fermented water extract of compost**"* with **ID: 23**, has been accepted for **Oral Presentation** by the Programme Committee of The South East Asia Plant Protection Conference (SEAPPRO) 2019 for 14 August at IPB International Convention Centre, Bogor, Indonesia.

Based on the terms and conditions, total amount of the registration fee is **IDR 750.000 for Domestic Participant / IDR 500.000 for Domestic Student.** Please confirm the registration payment to the following account number mentioned in our website no later than 29 July 2019. We would also want to remind you for submitting your full article no later than 10 August 2019. Please prepare a power point presentation for 7 minutes speech. Along with this letter we attached the rundown of SEAPPRO 2019.

Again, we thank you for your participation in SEAPPRO 2019. We believe that your participation will help to accelerate the global knowledge creation and sharing one step further. Please do not hesitate to contact us if you have any further questions. We are looking forward to see you in SEAPPRO 2019 at Bogor, Indonesia.

Kind regards,

Dr. Ir. Giyanto, M.Si
Chairman of Committee

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SOUTHEAST ASIA PLANT PROTECTION CONFERENCE PROGRAM

Date	Time	Activity
August 14th, 2019	08.00-08.40	Registration
	09.00-09.15	Opening
		Chairman of the Conference: Dr. Giyanto (report of the activity)
		Rector of IPB University: Dr. Ir. Arif Satria, M.Si (Opening Ceremony)
	09.15-09.35	**Keynote Speech:**
		Dr. Ir. Arif Satria, M.Si
		Crop protection 4.0
	09.35-10.00	Coffee Break
	10.00-11.30	**Invited Speakers Session :**
		Dr. Ir. Suryo Wiyono, M.Sc.Agr (Indonesia)
		Building New Phase of IPM in Indonesia
		Prof. Dr. Christian H. Schulze (Austria)
		Archipelagic Biodiversity.
		Prof. Dr. Chiharu Hongo (Japan)
		Remote Sensing for Future Protection on Crop.
		Dr. Christopher Wheeler (United State of America)
		Mating Disruption: A Tech for Crop Protection
	11.30-12.30	Poster Session
	12.30-13.30	Lunch Break
	13.30-14.15	Parallel Session 1
	14.15-15.00	Parallel Session 2
	15.00-15.45	Parallel Session 3
	15.45-16.30	Parallel Session 4
	16.30-17.15	Parallel Session 5
	17.15-	Closing Ceremony

Suwandi S <suwandi@fp.unsri.ac.id>

Hasil Review Paper Prosiding SEAPPRO

2 messages

Southeast Asia Plant Protection Conference seappro <seappro@apps.ipb.ac.id> Tue, Nov 26, 2019 at 3:49 PM
To: suwandi@fp.unsri.ac.id

Berikut kami lampirkan beberapa file **hasil review isi, format dan kesamaan dengan paper lain**.
mohon untuk dibaca "**file editor checklist**" terlebih dahulu, apabila perlu ada perbaikan lakukan perbaikan pada "**file fomat**", karena nanti yang akan dikembalikan ke panitia yaitu file format yang sudah diperbaiki baik isi maupun formatnya.
Hasil perbaikan harap dikirim kembali ke email maksimal tanggal **3 Desember 2019,**
Untuk informasi pembayaran akan diberitahukan lebih lanjut

Terimakasih

_____

salam
Panitia SEAPPRO 2019

6 attachments

- **E-10_Suwandi (Format).docx** 63K
- **E-10_Suwandi (rev).docx** 73K
- **E-10. Protection of chili pepper from mosaic virus disease and Aphis gossypii by a fermented water extract of compost.pdf** 2971K
- **Editor checklist - E10.pdf** 65K
- **References.pdf** 32K
- **SEAPPRO_Layout Guide_and_ExampleWordDocument.pdf** 598K

Suwandi fp <suwandi@fp.unsri.ac.id> Wed, Dec 4, 2019 at 8:20 AM
To: Southeast Asia Plant Protection Conference seappro <seappro@apps.ipb.ac.id>

Dear Panitia Seappro 2019,

Berikut ini disampaikan file perbaikan naskah kami yang berjudul "Protection of chili pepper from mosaic virus disease and *Aphis gossypii* by a fermented water extract of compost". Perbaikan utama yang dilakukan adalah mengurangi similarity dengan paper kami terdahulu dan menyesuaikan format seperti yang disampaikan pada komentar editor. Kami lebih menyukai komposisi asam amino ditempatkan pada bahan dan metoda untuk memperjelas karakteristik bahan yang kami gunakan.

Mohon maaf atas keterlambatannya. Besar harapan kami, naskah tersebut dapat dipublikasi pada prosiding. Terima kasih atas bantuan dan fasilitasinya.

Salam,
Suwandi

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[Quoted text hidden]

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Suwandi, Ph.D.
Phytopathology Laboratory, Department of Plant Protection
Faculty of Agriculture, Sriwijaya University
Jl. Palembang-Prabumulih Km.32 Indralaya 30662 Indonesia
Tel./Fax. +62-711-580663 E-mail: suwandi@fp.unsri.ac.id

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PROCEEDING
SOUTH EAST ASIA PLANT PROTECTION CONFERENCE

A Checklist for Editors

Manuscript ID **:** E10
Manuscript Title **:** Protection of chili pepper from mosaic virus disease and *Aphis gossypii* by a fermented water extract of compost

For each question, please place an **X** beside the relevant answer:

No.	Questions	Score			
		1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)
1.	Does the content of the manuscript match the scope of the journal?			X	
2.	Does the manuscript present novel result or provide solution for agricultural problems			X	
3.	Does the methodology chosen appropriate to answer the research objectives		X		
4.	Does the data support the conclusions			X	
5.	Is the work well organized and structured			X	
Editor's recommendation:					
				Yes	**No**
Should the manuscript be rejected?					**X**

If the manuscript is not rejected, what should be changed to make it acceptable for publication?

Hasil pengecekan Turnitin menunjukkan bahwa naskah memiliki kemiripan 39%. Hasil pengecekan juga menunjukkan bahwa 30% memiliki kemiripan dengan artikel "Effect of Compost Extract Fortified with Tempe on Chili Mosaic Virus Disease (Arumbinang Wajdi, Suwandi Suwandi, Chandra Irsan, A. Muslim, Harman Hamidson)" yang diterbitkan di International Journal of Environment, Agriculture and
Biotechnology. Detail hasil Turnitin terlampir kami kirimkan. Kemiripan diharapkan tidak melebihi 15%.

Perbaikan terkait isi naskah ada dalam review manuskrip.
Perbaikan terkait format penulisan ada dalam format manuskrip.
Silahkan diperbaiki sesuai dengan komentar, saran, maupun perbaikan lain.

Semua perbaikan baik isi maupun format dilakukan pada file formatting yang dilampirkan.

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Signature,

(……..…Dr. Giyanto…..…)

Protection of chili pepper from mosaic virus disease and *Aphis gossypii* by a fermented water extract of compost

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[2] Laboratory of Entomology, Department of Plant Protection, Faculty of Agriculture, Sriwijaya University
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Abstract. Mosaic and leaf curl diseases caused by multiple infections of viruses is one of the most devastating virus diseases of chili pepper. Improving plant resistance by treatment with exogenous bioactive compounds is promisingly developed for plant protection in organic chili production. The ~~control~~ potential of a fermented water extract of compost in mixture of 5% shrimp paste (SWCE+SP) ~~on~~to control mosaic and leaf curl diseases and its aphid vector was demonstrated in a naturally infested curly red chili (*Capsicum annuum*). SWCE+SP that contains amino acids had been sprayed weekly to whole plant parts at 0.2 and 2.0 % on potted *Capsicum* growing in field. Treatment with compost extract resulted in a significantly slower disease progression as represented by a lower area under disease progress curve (AUDPC) compared to control plant. Disease suppression was obtained at concentration as low as 0.2% and treatment with a higher concentration (2.0%) resulted in a higher suppression. SWCE+SP-treated plants were significantly less colonized by *Aphis gossypii* than control plant. The compost extract containing amino acids showed a remarkable potential to develop into an effective biostimulant for protection from virus disease and its insect vector, *Aphis gossypii*.

Keyword:???

1. Introduction

Virus diseases are epidemic and cause significant losses on chili pepper throughout the world. Mosaic are the most common symptoms of multiple viral infection on chili pepper. In Indonesia, mosaic disease was reported to be associated with *Cucumber mosaic virus* (CMV), *Chili veinal mottle virus* (ChiVMV), *Tobacco mosaic virus* (TMV), *Pepper yellow leaf curl virus* (PYLCV) and *Pepper vein yellowing virus* (PeVYV) [1]. Infected plant produces malformed leaves and stunting with reduced internode extension and smaller leaves. Infection during early growth stage can cause total losses due to flower dropping and fruit setting. Diseased plant produces unmarketable fruit (small and hard fruit) when infected during generative stage. Sukada *et al*. [2] reported that yield losses due to mosaic disease on chili pepper was 80-54%.

Plant viral diseases have generally been considered practically difficult to control as thus far, no agrochemical been developed for directly targeting viral life cycles [3]. The use of resistant plants is one of the most effective and widely employed strategies to control virus infections in fields [4]. Numerous studies have demonstrated that resistance inducers of natural origin including living

microorganisms, plant extracts, microbial cell-wall extracts, microbial metabolites, minerals, and ions can improve plant resistance against virus infection [5−7]. A water-based compost preparation, referred to as compost tea and compost-water extract are widely applied for improving plant growth and enhancing plant resistance against pathogen in organic cropping systems [8−11].

Despite its potential, field application of compost extract alone had been reported to have no or a minor control efficacy against viral disease [12]. Fortification of compost extract with microorganism or bioactive substances may increase its control efficacy against viral infection. A mixture of compost extract from vegetable wastes and siderophores-producing *Pseudomonas aeruginosa* Ch1 suppressed infection of CMV on tobacco as studied in a greenhouse test [13]. Fortification of compost with shrimp waste products resulted in an increase of amino acids contained in its water extract [14]. The water extract from the shrimp fortified compost is then called shrimp-waste compost extract (SWCE). SWCE exhibited biostimulant activities when applied to seeds, roots or plant leaves. We demonstrated that seed treatment with the fortified compost extract improved tolerance of rice seedling from salt stress [15]. Our field trials also suggested that the bark treatment with the compost extract exhibited curative effects against tapping panel dryness, a physiological disorder of rubber tree [16]. This study demonstrated the protection effects of a fermented liquid made from mixture of SWCE and shrimp paste (SWCE+SP) against natural infestation of mosaic disease and its vector *Aphis gossypii*.

2. Materials and methods

2.1. Plant material

Seedlings of CMV free-certified chili cultivar F1 Lado were prepared on insect-free growth room for 3 weeks. Seedlings were transplanted to a field soil amended with a fortified compost (N: 1.0 P: 6.1 K: 5.2 Mg: 8.6) as planting media in a-15L-polyethylene bag (polybag). Polybags were placed in 70-cm spacing in the experiment field of Faculty of Agriculture, Sriwijaya University, where surrounding chili pepper plants had been severely infected with mosaic disease. Plants were fertilized weekly with 250 mL/plant using a fortified liquid compost extract (10% (v/v) cow manure compost, 0,5% (v/v) microbial starter and 1% (w/v) NPK 16-16-16 fertilizer). No pesticides were used during the experiment and weeds were cleaned manually.

2.2. Compost extract and treatment

Compost-water extract preparation (SWCE+SP) was prepared through liquid fermentation of SWCE [14,16] in mixture with 5% (w/v) shrimp paste and 5% (w/v) sucrose. SWCE contained naturally occurring fermentative microorganisms such as *Lactobacillus* spp. and *Saccharomyces* spp. as starter for fermentation. The entire brewer contents were vigorously shaking by hand and then left to ferment in a plastic bottle at ambient temperature for 7 days. Three types of SWCE+SP preparations, TS, TSN and TSNJK were applied in the study. TS and TSN used shrimp paste collected from different locations in South Sumatra. Juice of *Citrus amblycarpa* (Hassk.) Ochse (jeruk limau) at 5% (v/v) was mixed in the TSN to produce TSNJK preparation. Content of amino acid in the TS and TSN preparation as analysed using the UPLC Amino Acid Analysis System was listed in Table 1. The preparation was applied at concentration 0.2 and 2.0% by spraying at dosage 600 L/Ha on upper and lower side of leaves started from one week after transplanting at one-week interval. Experiment was arranged in a completely randomized block factorial design with 15 replications (3 preparations of compost extract × 2 concentrations + one control treatment).

2.3. Assessment of disease and vector insect

Both incidence and severity of naturally infected mosaic disease were measured weekly for disease assessment. Incidence of individual diseased leaves were recorded weekly at 7 to 10 weeks after transplanting and calculated as percentage of leaves showing typical mosaic symptom out of total leaves per plant. Severity of naturally occurring mosaic disease was evaluated weekly at 3 to 10 weeks

after transplanting on a 0-to-5 scale as described by Lee and Ryu [17]. All plants in each treatment were scored; the ratings totaled and were divided by the number of plants multiplied by 5 to give a disease index in percent. Disease progression of each treatment was compared based on area under disease progress curve (AUDPC). The AUDPC of disease severity was computed following the method defined by Simko and Piepho [18].

Aphid species colonizing the tested plant during experiment were identified according to Blackman and Eastop [19]. Number of aphids and % plant infested were recorded weekly starting from 7 days after transplanting.

Table 1. Content of amino acids (mg/L) in compost-water extract preparations SWCE+SP (TS and TSN).

Amino acid	TS (satuan??)	TSN (satuan??)
Serine	830	830
Glutamic acid	2128	922
Phenylalanine	860	683
Isoleucine	863	388
Valine	937	603
Alanine	1159	1419
Arginine	493	283
Glycine	1207	842
Lysine	1417	13605
Aspartic acid	1791	815
Leucine	1462	815
Tyrosine	554	2127
Proline	874	391
Threonine	818	4848
Histidine	250	4678

2.4. Data analyses

Data were analyzed using Proc Glimmix based on model for factorial design with one control treatment and performed under SAS University Edition 2.8 9.4 M6 (SAS Institute Inc., Cary, NC, USA).

3. Results and discussion

3.1. Results

3.1.1. Disease development. The Protection of compos-water extract on development of naturally occurring mosaic disease was assessed based on the progress curve of disease incidence and severity. Compost extract treated plants showed a delaying disease progress curve of both incidence (Figure 1) and severity (Figure 2) compared to that of control (water treated) plants. Suppression of disease progress curve was recorded as early as one week after spraying and continued to a same manner as increasing of plant ages. Disease suppression was prominently observed after 6 weeks of transplanting when mosaic disease developed well in all plots. When treated at the same concentration, all preparations resulted in a similar effect on slowing disease progress curve. Treatment with a higher concentration (2.0%) resulted in a slower progress of both disease incidence and severity compared to treatment with lower concentration (0.2%). Progress curve of disease severity was less progressive compared to that of disease incidence (Figures 1 and 2).

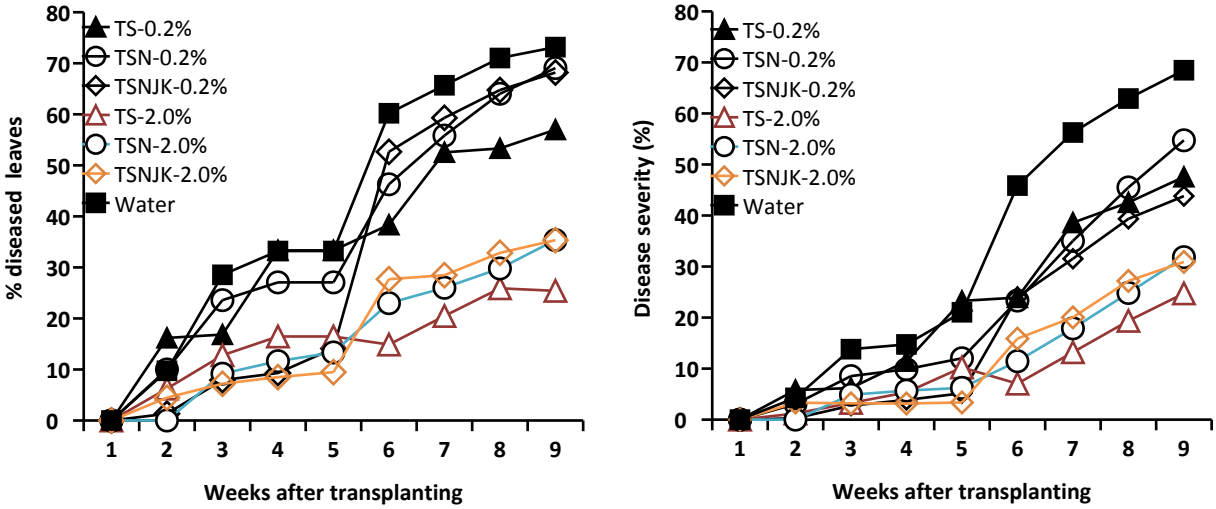

Figure 1. Mosaic incidence (left) and severity (right) progress curves of *Capsicum annum* sprayed weekly with different preparations of compost extract SWCE+SP (TS, TSN, TSNJK).

Protection from mosaic disease by treatment with compos-water extract was evaluated based on analysis of severity AUDPC. AUDPC of compost extract treated plants had in significantly (p<.001) lower than water treated plant. AUDPC amongst three preparation of compost extract was not significantly different (p main effect of preparation types =.709). Concentration significantly affected AUDPC value (p main effect of concentration <.001) whereas concentration at 2.0% resulted in significantly lower in AUDPC. Effect of concentration on AUDPC was not affected by preparation type (p interaction between concentration and preparation types =.268). Based on AUDPC, suppression of disease progress was ranged from 30.7 to 49.1% and 63.8 to 71.6% when treated at concentration 0.2% and 2.0%, respectively. Significant lower AUDPC or highest suppression of mosaic disease was obtained after application with 2.0% TS preparation (Table 2).

Table 2. Area under disease progress curve (AUDPC) of mosaic severity after treatment with different preparations of compost extract SWCE+SP

Treatment of compost extracts SWCE+SP	AUDPC[1]	% disease suppression relative to control[2]
TS-0.2%	12.29 ± 1.75 ab	30.7
TSN-0.2%	11.53 ± 1.37 bc	34.9
TSNJK-0.2%	9.02 ± 1.66 bcd	49.1
TS-2.0%	5.04 ± 0.98 d	71.6
TSN-2.0%	6.08 ± 1.26 cd	65.7
TSNJK-2.0%	6.41 ± 1.47 bcd	63.8
Water (control)	17.72 ± 1.41 a	-

[1] Mean ± S.E.M = Mean values ± Standard error of means of fifteen replications. Means followed by different letters are significantly different according to the Tukey's HSD-test at p<0.05.

[2] % disease suppression = [(AUDPC of treatment - AUDPC of control)/ AUDPC of control]*100.

3.1.2. Aphid colonization. Abundant aphid colonization was observed at 8 and 9 weeks after transplanting. Aphid was found colonizing on 72 and 89 of 90 compost extract treated plants at 8 and 9 weeks after transplanting, respectively, but all control plants was colonized by the insect vector. Significantly lower (p<.001) colonization of aphid on plants treated with compost extract compared than on water treated plants. Aphid colonization was significantly affected by preparation types (p main effect of preparation types <.001) with lower aphid number on TSN and TS compared to TSNJK treated plants. Plant sprayed with higher concentration of preparation (2.0%) significantly colonized by a lower number of aphid than spraying at concentration 0.2% (p main effect of concentration <.001). Effect of ferment spraying on aphid number was significantly affected by its concentration (p interaction between preparation type and concentration =.028). Treatment with 2% TS and TSN preparation resulted in lowest aphid colonization (Figure 2).

To assess the role of aphid colonization on disease progress, a correlation analysis was performed in individual and overall treatment. A highly correlation (Pearson correlation coefficient = 0.6045, p = <.0001) was observed between aphid colonization and AUDPC in overall treatment (Figure 2). An increased in aphid colonization has resulted in more progressive disease. Plant treated with TSNJK showed an inconsistent/weak association between aphid colonization and AUDPC as disease progress of some individual plants was not developed well as increasing of aphid population.

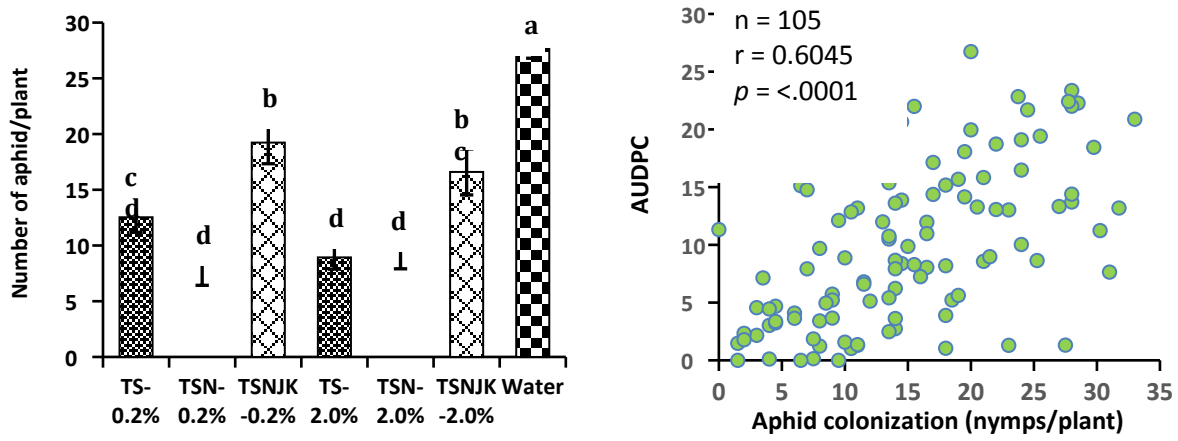

Figure 2. Colonization of aphid at 8 and 9 weeks after transplanting (left) and correlation plot between aphid colonization of individual plant and AUDPC of *Capsicum annum* sprayed weekly with different preparations of compost extract SWCE+SP (TS, TSN, TSNJK).

3.2. Discussion

In this study, we revealed the protective effects of a preparation of compost-water extract (SWCE+SP) on naturally occurring virus disease of curly red chili and its aphid vector, *Aphis gossypii*. The compost extract containing amino acids showed a remarkable potential to develop into an effective biostimulant for protection from virus disease and insect vector. Plants treated with all three preparations showed in significantly less progressive development of disease and less colonization of *A. gossypii* compared to control plant. Suppression of both disease and aphid following drenching application with TSN preparation was also confirmed in a growth-room experiment (unpublished data). Control of mosaic disease as demonstrated here could be caused by bioactive compounds present in the preparation. Compost extract used in the study contains at least 15 types of amino acid. Amino acids and their metabolites have a critical role during signaling processes as well as in enhancing plant immunity [20]. Numerous reports have revealed that exogenous application of the amino acids enhanced plant resistance against biotic and abiotic stresses. Accumulation of homoserine in Arabidopsis floral tissue had been determined to be associated with enhanced resistance to

Fusarium graminearum and *F. culmorum* and exogenous treatment of the amino acid could improve resistance against the pathogen [21]. Exogenous treatment of rice roots with low dose glutamine induced systemic resistance against blast disease by regulating salicylic acid signaling pathway in rice leaves [22]. Improved plant tolerance against virus following application with a low concentration of amino-acid-based nutritional biostimulant has been demonstrated by Betti *et al*. [23]. Mosaic disease severity of chili pepper inoculated with *PepMV* had been suppressed following foliar spray with 0.2-0.3% the amino acid preparation. The protection from viral infection was suggested to be associated with correction of amino acid ratio (GLU+GLN/ASP) imbalance due to viral infection through supplementation with amino acids contained in the biostimulant.

Preparation of compost extracts showed a slight variation in their efficacy against viral disease. When treated at 2% concentration, TS preparation showed the highest protection efficacy, though it has no suppression effect at 0.2%. Protection of plant by exogenous amino acid treatment is known to be affected by the protein source, method and degree of hydrolysis, as well as the amino acid and peptide composition [24]. TS contains a higher concentration of glutamic acid. Glutamine has been suggested to be act as regulators of the plant defense pathway [25]. TSN has a lower concentration of glutamic acid, but contains a higher composition of lysine. L-lysine metabolic pathway have recently discovered to play a major role in plant systemic acquired resistance (SAR) to pathogen infection through its catabolism product, N-hydroxypipecolic acid. N-hydroxypipecolic acid induces the expression of a set of major plant immune genes to enhance a variety of defense mechanisms [26].

There was a significant positive correlation between aphid colonization and disease progress in overall treatment. It was likely that disease protection by the compost extract could be explained through the indirect suppression against *A. gossypii*. Free amino acids found in phloem including both protein and nonprotein amino acids are known to be a limiting factor for aphid growth [27]. However, interaction between individual amino acid and aphid host plant resistance is host-specific [27], and therefore need to be further studied.

4. Conclusion

Regularly spraying of curly red chili with amino acid containing compost extracts could suppressed both natural infestation of mosaic diseases and its aphid vector, *Aphis gossypii.* Plant protection was obtained at concentration as low as 0.2% and treatment with a higher concentration (2.0%) resulted in a higher suppression.

Acknowledgments

The authors received funding from Kemenristekdikti under the Sriwijaya University Priority Applied Research Project 096/SP2H/LT/DPRM/IV/2019.

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Suwandi, Ph.D.
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