

A study on the raw materials standardization for industrialization of *Zanthoxylum piperitum* using lava seawater

Eun Bi Jang¹, Hyejin Hyeon¹, Yoonji Lee², Sung Hye Han⁴, Kwang Yeol Baek⁵, Su Young Jung⁶, Ki Sung Shin⁷, Weon-Jong Yoon^{3*}

¹Researcher, ²Senior researcher, and ³Team leader, Jeju Biodiversity Research Institute, Jeju Technopark, Seogwipo 63608, Republic of Korea

⁴Researcher, ⁵Research fellow, ⁶Director, ⁷Presedent, JoheunChinguDeul Corp., Jeju 63359, Republic of Korea

ABSTRACT

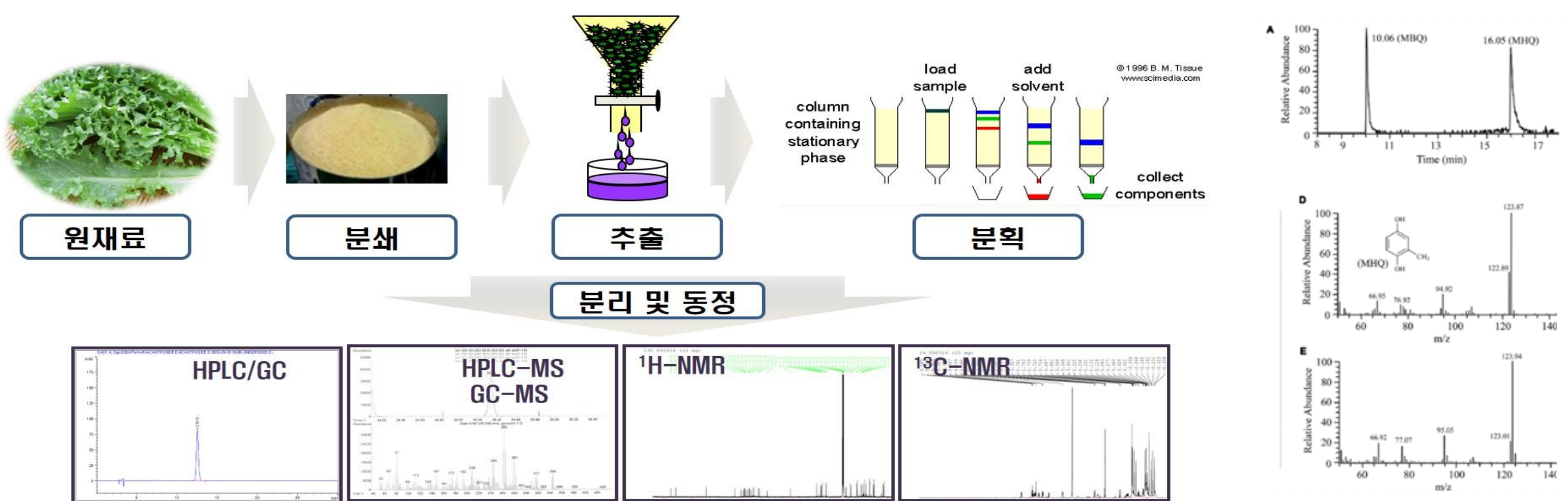
Zanthoxylum piperitum has been used as a spice or various folk remedies since ancient times, and studies on anti-bacterial, anti-inflammatory and analgesic effects have been reported. In this study, a raw material standardization study was conducted for the industrialization of *Z. piperitum*. First, optimal conditions for drying methods were established for the standardization of raw materials for *Z. piperitum*, and optimal conditions were established through content analysis using quercitrin, an indicator component, by obtaining samples every month. As for the drying method of *Z. piperitum*, it was confirmed that cold air drying was the best. It was analyzed that the index component content was highest in July. Next, for functional and toxicity evaluation of *Z. piperitum*, anti-oxidant, anti-inflammatory and immune enhancing efficacy and cytotoxicity were evaluated. Cytotoxicity of *Z. piperitum* was not observed, and it was confirmed that although it had an antioxidant and anti-inflammatory effect, it had no immune-enhancing effects. In addition, a study was conducted on the change in the efficacy of *Z. piperitum* using lava seawater, and as a result of the study, it was confirmed that the efficacy was superior when lava seawater was simultaneously treated. In conclusion, this study suggested the standardization of raw materials through the analysis of the index components and the functional evaluation of *Z. piperitum*, and it can be used as basic data for future industrialization.

INTRODUCTION

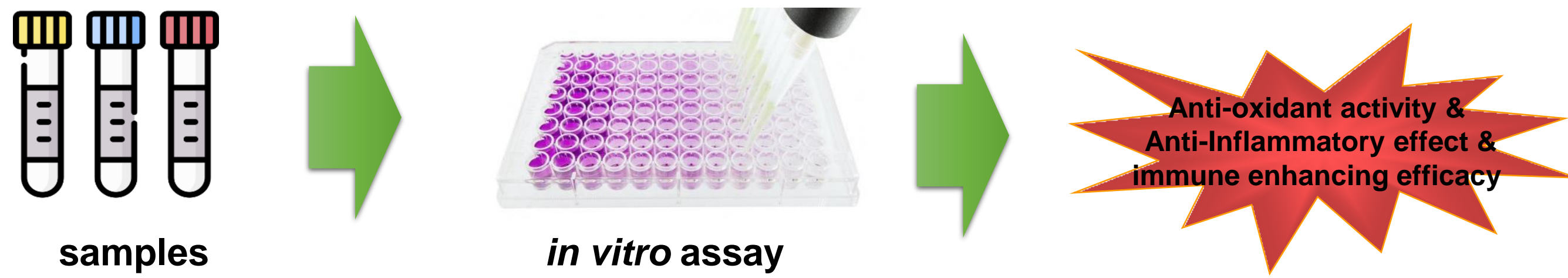


- ✓ Scientific name : *Zanthoxylum piperitum*
- ✓ Family name : Rutaceae
- ✓ Distribution area : Jeju-do, Chungcheong-do, Hamgyeong-do etc.
- ✓ Efficacy : anti-analgesic, anti-inflammation, neuralgia improvement etc.

METHODS



<Separation and purification for standardization of raw materials on *Z. piperitum*>



< Assessment methods on bioactivity of *Z. piperitum*>

CONCLUSION

- Cytotoxicity of *Z. piperitum* was not observed, and it was confirmed that although it had an antioxidant and anti-inflammatory effect, it had no immune-enhancing effects.
- In addition, a study was conducted on the change in the efficacy of *Z. piperitum* using lava seawater, and as a result of the study, it was confirmed that the efficacy was superior when lava seawater was simultaneously treated.
- This study suggested the standardization of raw materials through the analysis of the index components and the functional evaluation of *Z. piperitum*, and it can be used as basic data for future industrialization.

REFERENCE

- Kalu Kapuge Asanka Sanjeewa et al., Anti-inflammatory activity of a sulfated poly saccharide isolated from an enzymatic digest of brown seaweed *Sargassum horneri* in RAW 264.7 cells (2017), *Nutr Res Pract*, 11(1) 3-10.
- Weon-Jong Yoon et al., Anti-inflammatory effect of sargachromanol G isolated from *Sargassum siliquastrum* in RAW 264.7 cells (2012), *Arch Pharm Res*, 35(8) 1421-1440.

EXPERIMENTAL RESULTS

<Table 1> Analysis results on monthly nutritional and inorganic component in *Zanthoxylum piperitum*

Test items	June	July	August	September	시험방법
calorie(kcal/100g)	354.0	353.7	358.3	358.4	식품공전 제8.2.1.6
carbohydrate(g/100g)	81.2	75.7	77.7	75.4	식품공전 제8.2.1.4
moisture(%)	7.8	7.6	6.3	6.5	식품공전 제8.2.1.1
ash(%)	4.2	5.7	4.8	6.3	식품공전 제8.2.1.2
protein(g/100g)	6.4	9.4	10.8	9.8	식품공전 제8.2.1.3.1
fat(g/100g)	0.4	1.4	0.5	2.0	식품공전 제8.2.1.5.1
sugars(g/100g)	3.2	3.8	4.0	3.9	식품공전 제8.2.1.4.1.4
saturated fat(g/100g)	0.1	0.2	0.2	0.2	식품공전 제8.2.1.5.4
trans fat(g/100g)	0.0	0.0	0.0	0.0	식품공전 제8.2.1.5.4
cholesterol(mg/100g)	0.0	0.0	0.0	0.0	식품공전 제8.2.1.5.5
sodium(mg/100g)	47.6	60.7	59.7	99.9	식품공전 제8.2.2.1
lead(mg/kg)	0.23	0.38	1.23	0.20	식품공전 제8.2.2.1
cadmium(mg/kg)	0.37	0.25	0.19	0.36	식품공전 제8.2.2.1
arsenic(mg/kg)	N.D.	N.D.	0.53	N.D.	식품공전 제8.2.2.2.4
Mercury(mg/kg)	0.04	0.05	0.03	0.03	식품공전 제8.2.2.2.1

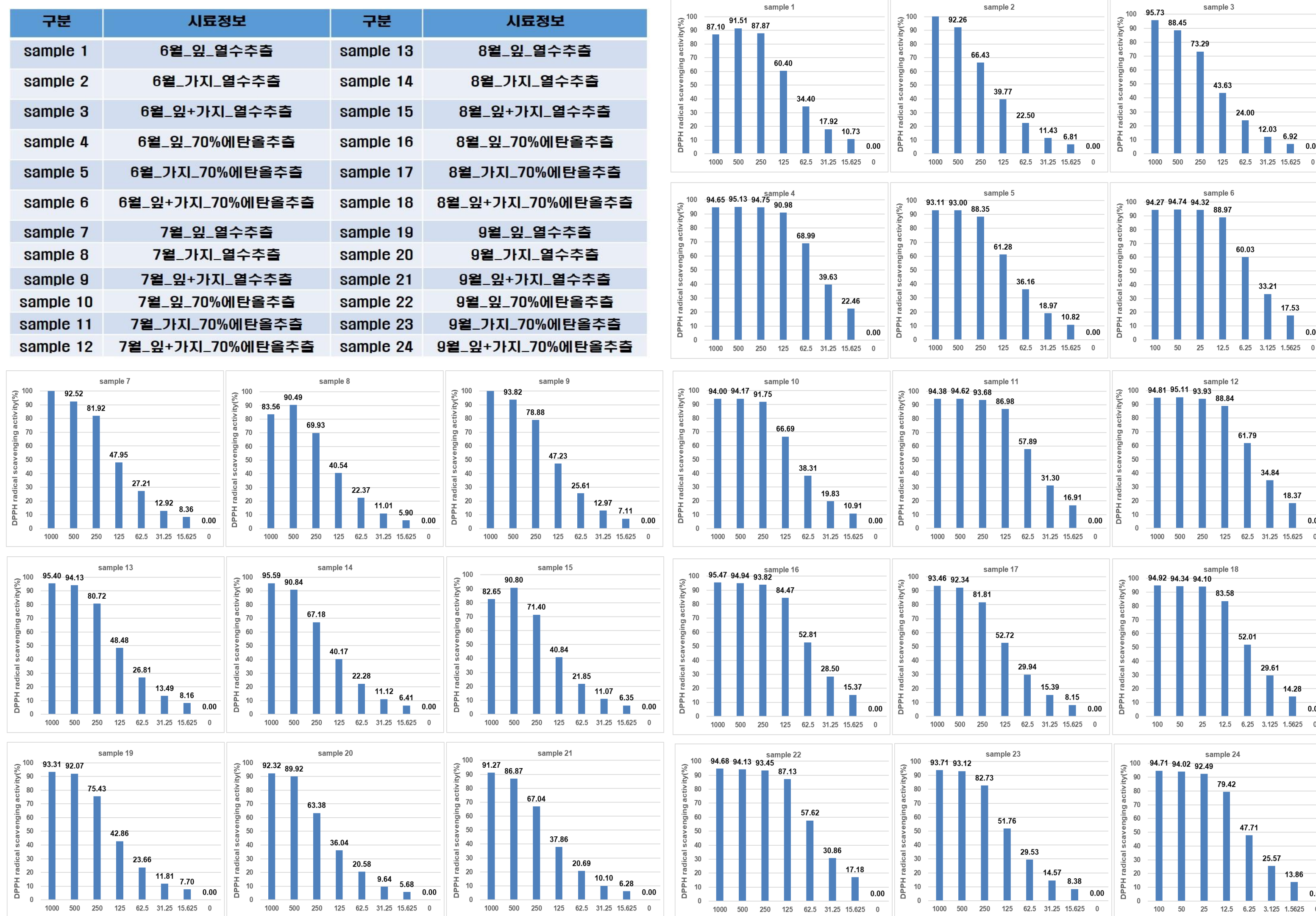


Figure 1. Anti-oxidant activity on variety sample of *Zanthoxylum piperitum*. DPPH radical-scavenging activity was determined according to the methods of Blois (Blois, 1958). The scavenging activity was estimated by measuring the absorption of the mixture at 517 nm, reflecting the amount of DPPH radical remaining in the solution. Ascorbic acid was used as positive controls.

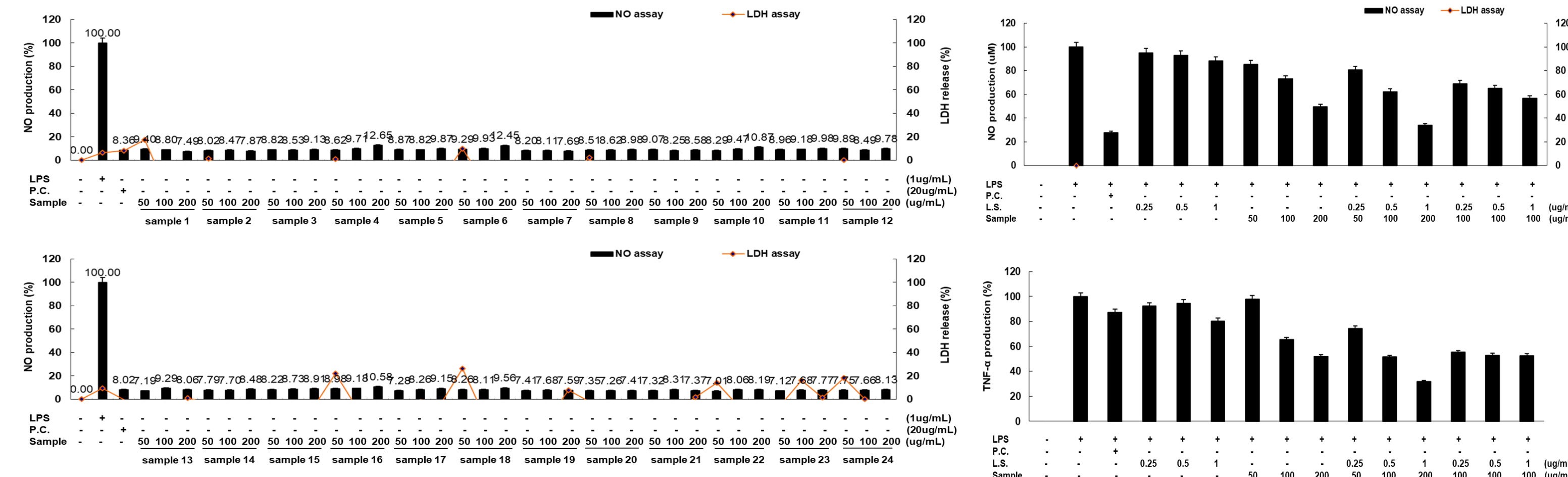


Figure 2. Effect of immunomodulatory factors and cytotoxicity on variety sample of *Z. piperitum* in RAW 264.7 cells. The production of immunomodulatory factors was assayed in the culture medium for 24 h in the presence of LPS(1 µg/mL) and variety sample(50, 100, and 200 µg/mL). Cytotoxicity was determined using the LDH method. Values are the mean \pm SEM of triplicate experiments. *P<0.05; **P<0.01

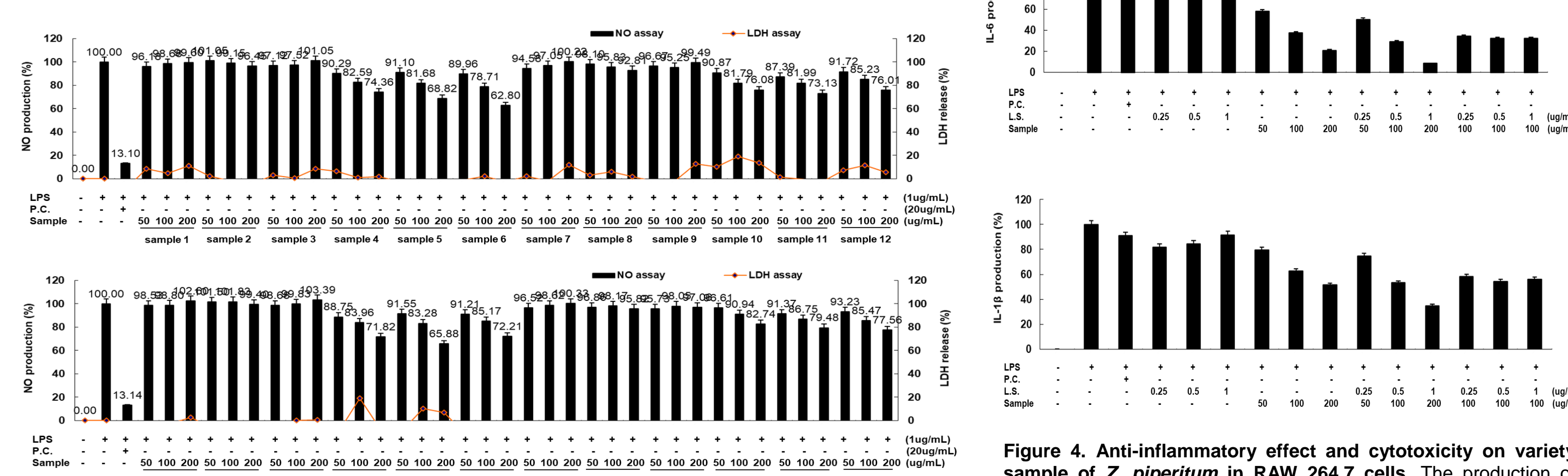


Figure 3. Effect of pro-inflammatory factors on variety sample of *Z. piperitum* in RAW 264.7 cells. The production of pro-inflammatory mediators was assayed in the culture medium for 24 h in the presence of LPS(1 µg/mL) and variety sample(50, 100, and 200 µg/mL). Cytotoxicity was determined using the LDH method. Values are the mean \pm SEM of triplicate experiments. *P<0.05; **P<0.01

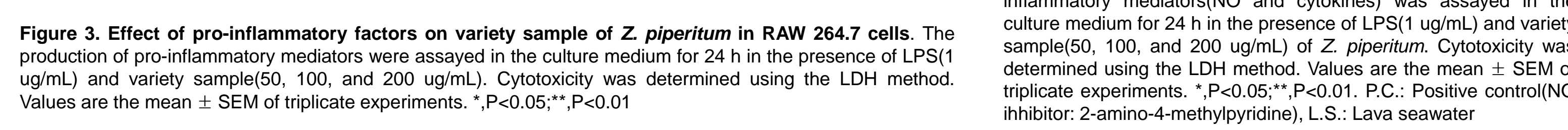


Figure 4. Anti-inflammatory effect and cytotoxicity on variety sample of *Z. piperitum* in RAW 264.7 cells. The production of inflammatory mediators(NO and cytokines) was assayed in the culture medium for 24 h in the presence of LPS(1 µg/mL) and variety sample(50, 100, and 200 µg/mL). Cytotoxicity was determined using the LDH method. Values are the mean \pm SEM of triplicate experiments. *P<0.05; **P<0.01. P.C.: Positive control(NO inhibitor: 2-amino-4-methylpyridine), L.S.: Lava seawater

❖ Acknowledgement: This work was supported by the SME Technology Development Support Project grant funded by the Ministry of SMEs and Startups (MSS)(No.S3226168).

Tel. +82-64-720-2810, Fax. +82-64-720-2801
Email: yyjkl@jeutp.or.kr

JTP 제주테크노파크
JEJU TECHNOPARK