

REGULATION OF AUXIN COMPOUND IN IN VITRO CULTURE OF GO POTATO SEEDS PRODUCTION

Syarif Husen; Misbah Ruhiyat; Nurina Farahiyah

Departemen of Agrotechnology ,University of Muhammadiyah Malang
Tlogomas 246 Malang 65151

email: syarifhusen.hasan@gmail.com; m_ruhiyat@yahoo.co.id; nagamitsuazuki@gmail.com

Abstract

Auxin has a role in the growth and development of plant roots. This research examined the effect of IAA and NAA growth regulators in in vitro culture of potato. Employing group randomized design, this research was conducted in "Plant improvement" in vitro laboratory of FPP UMM. The results showed that the auxin compound which served as a growth regulator substance had a significant effect on shoot and root induction of in vitro potato. IAA compound was faster in inducing roots compared to NAA, but IAA could also reduce the number of roots. IAA addition could strengthen the plant during acclimatization.

Keywords: potato, in vitro, IAA, NAA, acclimatization.

BACKGROUND

Granola Kembang (*Solanum tuberosum* L.) potato cultivars are growing widely in East Java especially in Pasuruan, Probolinggo, Magetan Lumajang and Malang regions. Its potential production reaches 38 - 50 tons / ha. It is a kind food source that is potentially developed in Indonesia. Potato production in Europe reaches 25.5 tons / ha, while in Indonesia is only about 16 tons / ha. The low productivity of potato in Indonesia is caused by many factors such as environmental problem (soil and climate) that causes potato cultivation is susceptible to pests and diseases, another problem is the low use of high quality seeds by farmers.

Granola Kembang (GK) potato seeds multiplication using in vitro technique is able to produce large amount of seeds in relatively short time and it is safe from diseases. *Granola Kembang* potatoes varieties are relatively resistant to *Phytophthora infestans* (Susiyati and Prahardini, 2004). Some problems still exist in in vitro reproduction of GK potato such as vitrification symptoms, shoot tip necrosis symptoms and weak plantlet during acclimatization. So it is necessary to regulate the right growing media, it can be done by setting the zpt compound in the culture media. In in vitro culture of potato, the effect of IAA and NAA auxin has been studied by Hoque (2010), (Sultana, 2001) and Chaudhari & Pallavi (2014). Thus it can be used as the reference for the propagation of *Granola Kembang* potato which becomes the superior product of East Java.

METHODS

This research was conducted in "Plant Improvement" in vitro laboratory of FPP UMM and greenhouse in Pujon. This research was started from June to December 2015. The varieties used were *Granola Kembang* (GK) potatoes cultivars. The design of experiment was Randomized Block Design with 6 treatments and 4 times replication, including: (P1 = IAA 0.005 ppm + Kinetin 1 ppm; P2 = IAA 0.010 ppm + Kinetin 1.5 ppm; P3 = IAA 0.015 ppm +

Kinetin 2 ppm; P4 = NAA 0.005 ppm + Kinetin 1 ppm; P5 = NAA 0.010 ppm + Kinetin 1.5 ppm; P6 = NAA 0.015 ppm + Kinetin 2 ppm. The planting material was obtained from plantlet which was free from granola potato viruses; it was the collection of researchers at in vitro laboratory of FPP-UMM. The base media used were MS medium, pH 5.8. Plantlet was planted according to the treatment in 20 ml MS media. Culture bottle was placed in the incubation room with 16 hours lighting, 100 $\mu\text{molm}^{-2}\text{s}^{-1}$ lamp, 24°C room temperature. At Day 45 of planting, plantlet was moved to acclimatization media which used the mixture of compost and charcoal husk as planting media. Plantlet was planted in a tray with spacing of 10 x 5 cm; fungicide and insecticide were given during the acclimatization. The data of plantlet growth which were taken including the first grow of root, shoot length, number of roots, root length and life percentage during acclimatization.

RESULTS AND DISCUSSION

Number of Roots

Table 1 shows that the treatment of NAA 0.005 ppm + kinetin 1 ppm gave the best result on roots increase at 12-16 DAP. At Day 20, the treatment of NAA 0.005 ppm + kinetin 1 ppm; NAA 0.010 ppm + kinetin 1.5 ppm and IAA 0.005 ppm + kinetin 1 ppm showed the best result to the increase of root number.

Table 1. The Average Score of the Number of Potato (*Solanum tuberosum* L.) Roots at 4 -20 Days After Planting

Plant Growth Regulator Treatment (ppm)			Observation Period (DAP)				
			Number of Roots Average				
IAA	NAA	Kinetin	4	8	12	16	20
0.005	0	1	0.00	2.63 a	3.17 bc	3.42 bc	3.52 b
0.010	0	1.5	0.00	1.96 a	2.42 a	2.84 ab	3.04 ab
0.015	0	2	0.00	1.87 a	2.27 a	2.47 a	2.58 a
0	0.005	1	0.00	2.63 a	3.52 c	3.73 c	3.75 b
0	0.010	1.5	0.00	1.87 a	2.80 abc	3.34 bc	3.56 b
0	0.015	2	0.00	1.71 a	2.44 ab	3.12 abc	3.14 ab
Coefficient of Variation(%)			-	20.61	11.54	11.17	10.42
HSD 5%			-	1.00	0.74	0.81	0.78

Notes : The numbers followed by same letter in the same treatment column showing no significant difference based of HSD 5%.

DAP: Days After Planting

Shoot Length

Table 2 shows that the treatment of auxin and cytokinin growth regulator was not significantly different towards shoot length parameter at Day 4-20 after planting. The mean value of shoot length showed that NAA 0.005 ppm + kinetin 1 ppm gave the best result compared to other treatment at Day 20 after planting.

Table 2. The Average Score of Potato (*Solanum tuberosum* L.) Shoot Length at 4 -20 Days After Planting

Plant Growth Regulator Treatment (ppm)			Observation Period (HST)				
			Shoot Length Average				
IAA	NAA	Kinetin	4	8	12	16	20
0.005	0	1	0.76 a	1.64 a	2.34 a	2.80 a	3.41 a
0.010	0	1.5	0.66 a	1.46 a	2.30 a	2.82 a	3.31 a
0.015	0	2	0.75 a	1.81 a	2.73 a	3.20 a	3.50 a
0	0.005	1	0.68 a	1.64 a	2.61 a	3.25 a	3.80 a
0	0.010	1,5	0.75 a	1.68 a	2.58 a	3.08 a	3.51 a
0	0.015	2	0.74 a	1.70 a	2.50 a	3.12 a	3.54 a
KK (%)			19.40	10.73	12.40	9.52	6.55
BNJ 5%			0.32	0.41	0.72	0.67	0.3

Plantlet Life Percentage during Acclimatization Stage

The parameter of potato plant life percentage in the acclimatization stage was used to determine the life of the plantlet during the acclimatization stage and test the potato plantlet vigor. The percentage of plantlet life in treatment of NAA 0.005 ppm + kinetin 1 ppm was more constant and higher than other treatments at Week 3 after planting (figure 1).

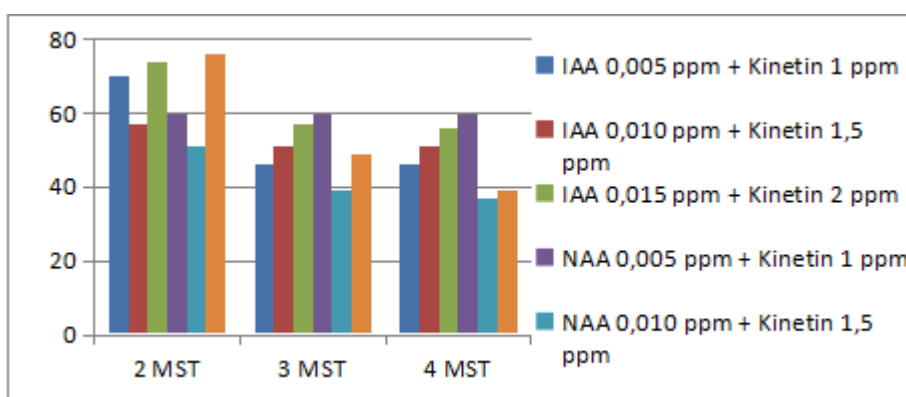


Figure 1. The Average of Plantlet Life Percentage in Week 2- 4 After Planting

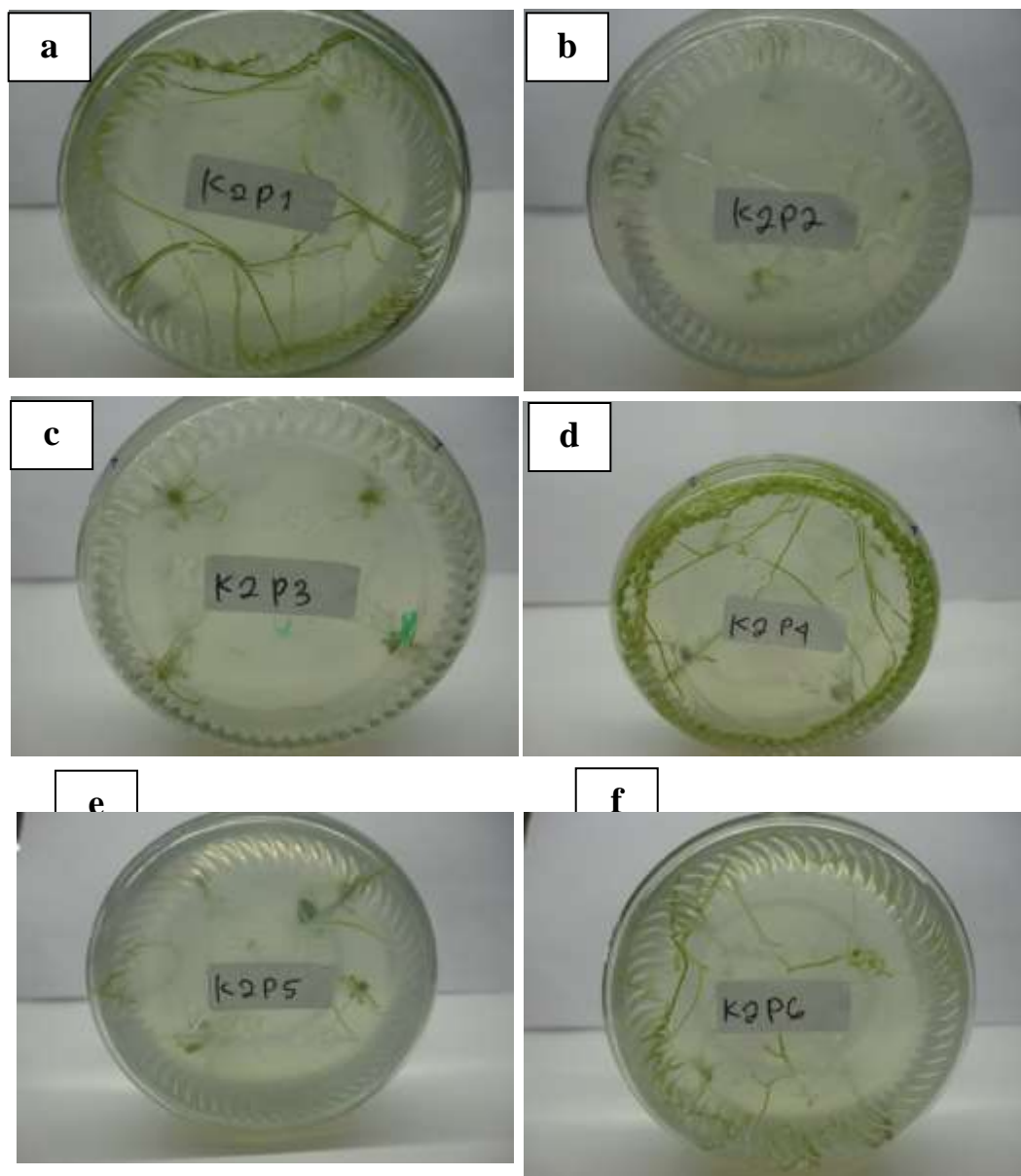


Figure 1. Potato plantlet root. (a) treatment of IAA 0,005 ppm + kinetin 1 ppm, (b) treatment of IAA 0,010 ppm + kinetin 1,5 ppm, (c) treatment of IAA 0,015 ppm + kinetin 2 ppm, (d) treatment of NAA 0,005 ppm + kinetin 1 ppm, (e) treatment of NAA 0,010 ppm + kinetin 1,5 ppm, (f) treatment of NAA 0,015 ppm + kinetin 2 ppm.

CONCLUSION

Auxin compounds as growth regulators had a significant effect on shoots and root induction of in vitro potatoes. IAA compounds induced roots faster than NAA, but IAA could also reduce the number of roots. IAA addition could strengthen the plant during acclimatization.

REFERENCES

- Chaudhary, B dan P. Mittal. 2014. *The effects of Different Concentration and Combination of Growth Regulators on the Micro Propagation Of Potato (Solanum tuberosum L.)*. International Journal of Education and Science Research (IJESRR), 1 (4) : 65-70.
- Hoque, M. E. 2010. *In-Vitro Regeneration Potentiality Of Potato Under Different Hormonal Combination*. World J. of Agric. Sci., 6 (6): 660-663.
- Sultana, R.S., 2001. *Callus Induction And Evaluations In Potato (Solanum Tuberosum L.)* M.Sc. Thesis. Rajshahi Univ. Rajshahi, Bangladesh.