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Breaking Dormancy of Gladiolus Corms *(Gladiolus hybridus)* Using Plant Growth Regulators

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Abstract. A long period of dormancy is one of the constraints in the supply of seed plant gladiolus. The objective of the research was to ivestigate the effect of plant growth regulators (PGR) in breaking the dormancy of gladiolus corms cv. Nabila. The experiment was used α-napthalene acetic acid (NAA) and gibberelic acid (GA_3). The concentration of NAA was 0, 50, 100, and 150 ppm, while the GA_3 concentrations were 0, 50 100, and 150 ppm. The randomized complete block design (RCBD) with one factor was used in the first experiment with five replications. In the second experiment the best combination of both PGR from the first experiment were selected and applied to corms with different storage periodes (0, 2, 4, 6, and 8 weeks). The RCBD with two factor and five replications was used. The results of the first experiment showed that all treatment using NAA and GA_3 individually accelerated the rooting and sprouting of the corms therefore indicating the dormancy breaking occurred. The results of the second experiment showed that 100 ppm NAA and 50 ppm GA gave similar effect in dormancy breaking of the gladiol corms. The corms directly harvested and storage for two weeks were easyly rooted and sprouted.

Keywords: NAA; GA_3; storage

Corm is a stalk that had swelled to a change in the form of an organ for storing food reserves that can serve as plant propagation material. During the vegetative phase to the generative phase corms will shrink and the formation of new corms (Badriah 2007). Gladiolus corms have a dormancy period ranging from 2.5 - 3 months (Cohat 1993). Gladiolus corms that have broken dormancy is characterized by the appearance of a bulge root prospective small white circle at the bottom of corms, and the emergence of shoots Herlina (1995).

Giglou & Hajieghrari (2008) reported naftalene acetic acid (NAA) in vitro propagation can be used to encourage root formation *Gladiolus grandiflorus*. Treatment 2 ppm NAA without BAP resulted in an average number of roots per explant 20.8 more than control (12.2). Rahman *et al.* (2006) stated that GA_3 treatment also can break dormancy and accelerate the growth of shoots of garlic (*Allium sativum* L). Soaking for 24 hours with 125 ppm GA_3 on local garlic India produced 20.0% more tubers germinate compared with controls (0.0%) and 250 ppm (13.3%) at 15 days after planting.

Dormancy period is one of the obstacles in supplying of gladiolus corms. Corms are not always available causing gladiolus flower production is insufficient demand continuously. Breaking dormancy of gladiolus corms need to be developed so that the effective provision of quality corms can be met continuously to support the increased production of gladiolus flowers.

MATERIALS AND METHODS

The research comprised of two experiment, i.e (1) effect of NAA and GA_3 on breaking of corms dormancy of gladiolus and (2) Effect of NAA and GA_3 on breaking dormancy of corms gladiolus storage at different period. Corms of gladiolus cv. Nabila with diameter 2.4-4.0 cm were used in this study. While the plant growth regulator used were NAA and GA_3.

The concentration of NAA was 0, 50, 100, and 150 ppm, while the GA_3 concentrations were 0, 50 100 and 150 ppm. Gladiolus corms cleaned and dried for 2 weeks. PGR treatment is done by soaking the corms in a solution for 24 hours. After the soaking treatment, then corms stored on a shelf in the storage room. The randomized complete block design (RCBD) with one factor was used in the first experiment with five replications. In the second experiment the best of both PGR from the first experiment were selected and applied to corms with different storage periodes (0, 2, 4, 6, and 8 weeks). The RCBD with two factor and five replications was used.

RESULTS

PGR treatment on gladiolus corms accelerate the growth of root primordia in the form of corm circular white spots on the bottom of the corms (Fig. 1). Application of 50 ppm NAA accelerated the growth of primordial roots faster 19.6 days and sprouting time on average 19.2 days faster than without PGR (Fig. 2 and 3). Increasing concentrations NAA up to 100 ppm accelerated the rooting, *i.e* 4.4 days faster than of NAA 50 ppm.

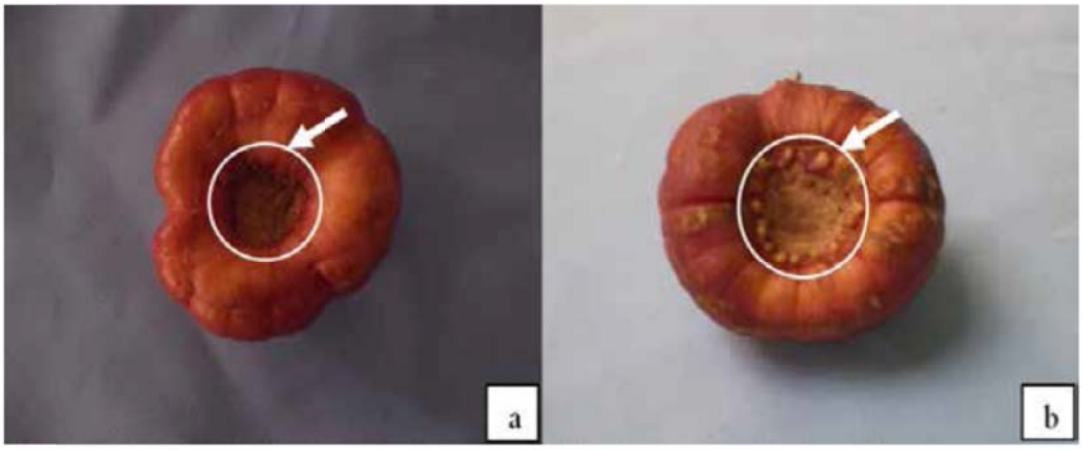

Figure 1 **At the same observation time, Corm without PGR treatment has not emerged root primordia (a) and corms with PGR treatment root primordia first appear at the bottom of the circular earring (b)**

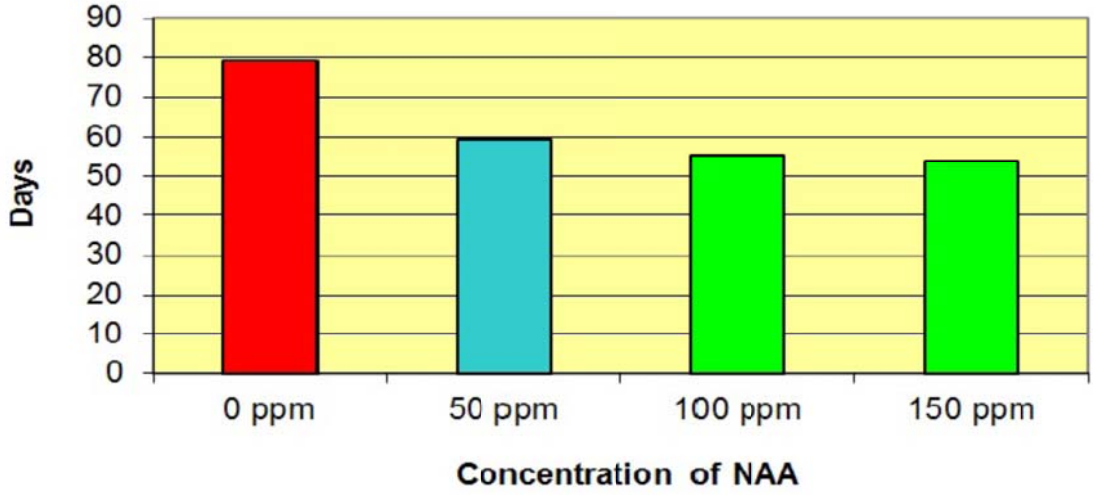

Figure 2. Effect of NAA on rooted times

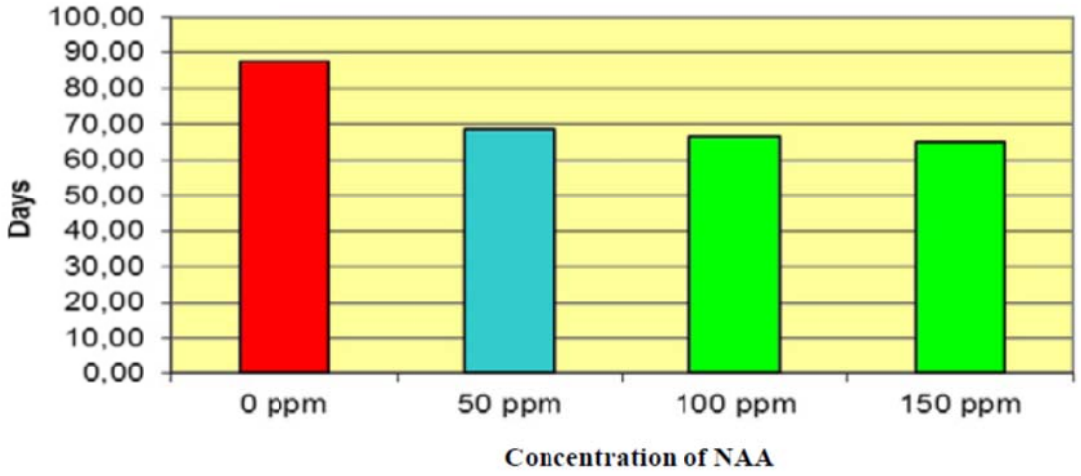

Figure 3. Effect of NAA on times sprouted times

Increasing concentrations of 150 ppm NAA did not accelerate the rooting. This showed that application of 100 ppm NAA is more effective to induce the emergence of root compared with 50 and 150 ppm NAA. NAA stimulated roots formations. As pointed Wattimena (1988) stated that the NAA is a synthetic auxin compounds have activity as IAA that can be used as a hormone to encourage root formation.

GA_3 treatment with a concentration of 50 ppm accelerated rooting emergence 22 days, accelerated time to sprouted on average 21.7 days faster than without PGR (Fig. 4 and 5). Increasing GA_3 concentrations of 100 ppm and 150 ppm GA_3 did not accelerate rooting emergence and sprouting time. This suggests that 50 ppm GA3 treatment is effective for breaking dormancy of gladiolus corms.

Results of the laboratory analysis of samples Nabila gladiolus corms after harvest containing 6.54 ppm abscisic acid (ABA). Kucera *et al.* (2005) stated that the ABA is the caused of seed dormancy and inhibits germination. Khan (1977) stated the hypothesis that the seeds containg of inhibitor will be germinated in the presence of gibberellins and cytokinins. Gibberellins

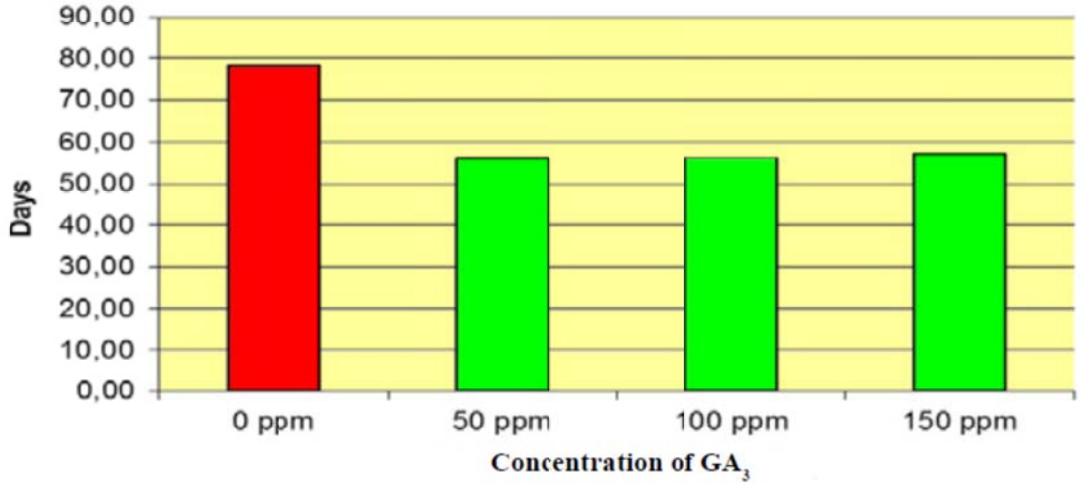

Figure 4. Effect of GA_3 on rooted times

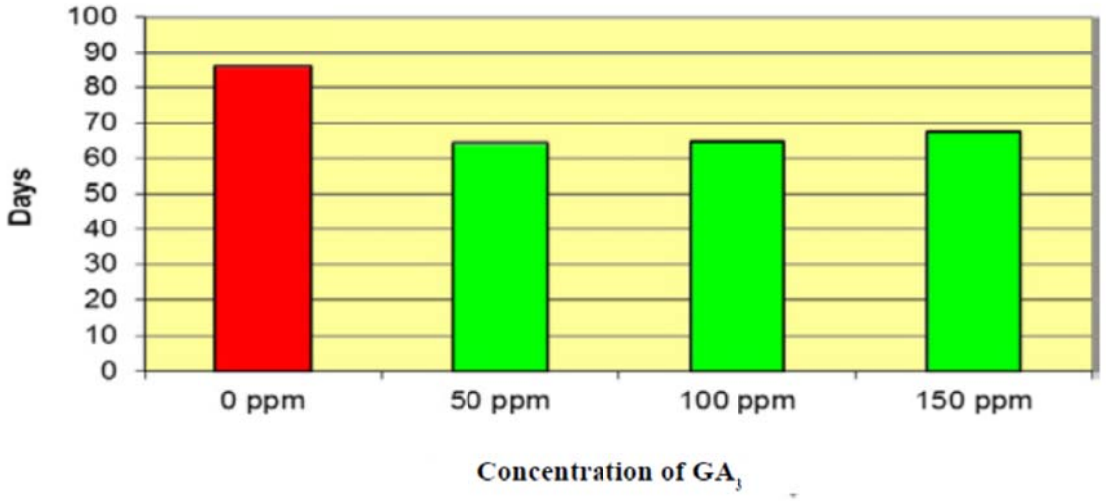

Figure 5. Effect of GA_3 on times sprouted times

have a major role in the regulation of germination and dormancy negate. while cytokinin has a secondary role to allow the (permissive) germination.

The results of the second experiment showed that effectiveness the PGR treatment on breaking dormancy was influenced by storage periode of the corms. Freshly harvested of corms up to 4 weeks after harvest faster rooted and sprouted compared with 6 and 8 weeks (Table 1). This suggests that the PGR is more effective when it was given immediately after the corms harvested.

Table 1. Effect of PGR and storage period at time of rooted, time of sprouted, the number of potential buds and buds growth number

Treatments	Times of rooted (Days after treatment)	Times of sprouted 0.5 cm (Days after treatment)	Buds growth number
PGR			
NAA 100 ppm	70.42 a	81.52 a	1.02 a
GA_3 50 ppm	70.28 a	81.23 a	1.03 a
Storage periodes of corms			
0 weeks	68.46 b	78.65 b	1.02 a
2 weeks	68.98 b	78.96 b	1.02 a
4 weeks	70.06 b	82.78 a	1.03 a
6 weeks	72.06 a	83.20 a	1.03 a
8 weeks	72.20 a	83.30 a	1.02 a

Application of NAA immediately stimulate root formation, while application of GA_3 from outside also accelerated the reform of germination by producing enough energy in the process of germination, so the formation of roots and shoots were occured more quickly. As stated Gardner *et al*. (2008) that giberlin encourage the release of the enzyme α-amylase and the results in the form of starch hydrolysis. PGR treatments and storage periodes of corms did not significantly affect the number of buds that growth on the corms. The average number of buds that growth 1.02 (Table 1).

CONCLUSION

1. NAA and GA_3, can be used to breaking dormancy of corms of gldiolus cv. Nabila.
2. Application of 100 ppm NAA and 50 ppm GA_3 can shorten storage periode.
3. NAA and GA_3 can be applied immediately after corm harvest to reduce dormancy periode

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REFERENCES

1. Badriah, DS 1995, 'Botani dan ekologi gladiol', di dalam Muharam, A, Sutater, T, Syaifullah & Kusuma, S (ed.), *Gladiol,* Balai Penelitian Tanaman Hias, Badan Penelitian dan Pengembangan Pertanian, Jakarta. hlm 3-10.
2. Cohat, J 1993, '*Gladiolus'*, in August, DH & Marcel, LN (ed.), *The physiology of flower bulbs*, Elsevie,. Amsterdam, Hlm. 297-320.
3. Gardner, FP, Pearce, RB & Mitchell, RL 2008, *Fisiologi tanaman budidaya,* Cetakan ke-8, Susilo H, Subiyanto. penerjemah, UI Press, Jakarta, Terjemahan dari: *Physiology of Crop Plants*. 428 h.
4. Giglou, MT & Hajieghrari, B 2008, '*In vitro* study on regeneration of *Gladiolus grandiflorus* corm calli as affected by plant growth regulators', *Pakistan Journal of Biological Sciences,* vol. 11, no. 8, pp. 1147-51.
5. Herlina, D 1995, 'Kultur teknik gladiol', dalam Muharam, A, Sutater, T, Syaifullah & Kusuma, S (ed.) *Gladiol,* Balai Penelitian Tanaman Hias. Badan Penelitian dan Pengembangan Pertanian, Jakarta, hlm. 29-34.
6. Kucera, B, Cohn, MA & Metzger, GL 2005, 'Plant hormone interactions during seed dormancy release and germination', *Seed Sci Research,* vol. 15, pp. 281-307.
7. Khan, AA 1977, *The physiology and biochemistry of seed dormancy and germination,* North Holland Biomdical Pr, pp. 7-46.
8. Rahman, MH, Haque, MS, Karim, MA & Ahmed, M 2006, 'Effect of giberelic acid (GA_3) on breaking dormancy in garlic (*Allium sativum* L.)', *Int. Journal of Agriculture and Biology,* vol. 8, no. 1, pp. 63-5.
9. Wattimena, GA 1988, *Zat pengatur tumbuh tanaman,* Second University Development Project World Loan No. 2547-IND, Diperbanyak oleh Pusat Antar Universitas Institut Pertanian Bogor bekerjasama dengan Lembaga Sumberdaya Informasi-IPB, hlm. 145.