



## Article

# The Influence of Using Bud Breaking Dormancy Agents (Dormex and Erger) on Vegetative Growth of Red Roomy Grapevine

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**Abstract:** Using dormancy breaking chemicals is necessary to produce temperate fruits in low chill regions. As usual Hydrogen cyanamide is the most common chemical which used in this concern. Recently, some country restricted it due to its high toxicity. Therefore, this experiment aimed to using an alternative product Erger® (is a biostimulator containing an organic nitrogen and polysaccharides with low toxicity) and calcium nitrate. Different doses of Erger are used (3 % and 5%) and calcium nitrate at a concentration of 3% lonely or combined with the prementioned concentrations of Erger. The spray was 45 or 30 days before bud opening or in both of them. Red Roomy grapevines were used for this experiment. Results showed that spraying dormex or Erger at a concentration of 5% combined with calcium nitrate at a concentration of 3% increased bud opening % also improved the vegetative growth and induced (N, P and K) leaves of Red Roomy grapevines content.

**Key words:** Dormex, Erger, dormancy, bud break. Red Roomy Vegetative growth.

## 1. Introduction

Grapes are considered one of the most important fruit crops in the world, valued not only for fresh consumption but also for the production of raisins and juice. In Egypt, the majority of grape cultivars grown are table grapes, all of which belong to the European grape species (*Vitis vinifera* L.).

In Egypt, grapes rank second among fruit crops after citrus. Over the past two decades, many grape cultivars have been introduced to Egypt. Most of these new cultivars have been planted in newly reclaimed lands, while the old agricultural lands in Middle and Upper Egypt are still largely cultivated with Red Roomy.

Grapevines require a certain number of chilling hours, depending on their genotype, typically ranging from 40 to 400 hours, to achieve normal budburst. Insufficient budburst can negatively affect both vineyard yield and the uniformity of grape clusters. To address this, growers often apply various

chemicals to break dormancy and promote budburst hydrogen cyanamide (dormex) one of them (Sassine, 2019)

in recent years, European Union countries have banned the use of hydrogen cyanamide (HC) and classified it as highly toxic. Similarly, (Dormex) a commercial formulation of hydrogen cyanamide has been prohibited in several countries, including Turkey, after being identified as carcinogenic to humans (Dmrak *et al.*, 2016). As a result, alternative compounds have been investigated to overcome bud dormancy in fruit crops (Potjanapimon *et al.*, 2007) One such product is Erger, an organic nitrogen-based stimulative compound, which, when applied in combination with calcium nitrate ( $\text{Ca}(\text{NO}_3)_2$ ), has shown to be a less hazardous option for promoting budburst.

Erger® is an innovative mineral-organic product that has gained considerable attention for its diverse applications and benefits in agriculture. Formulated with a distinctive combination of minerals and organic compounds, Erger® presents a promising approach to enhancing crop growth, improving soil health, and reducing environmental impact. By integrating the nutritional strength of minerals with the sustainability of organic components, this product offers a balanced, eco-friendly solution for modern farming systems. Its demonstrated effectiveness and environmentally responsible formulation position Erger® as a forward-thinking alternative in agricultural management, supporting both yield optimization and long-term ecological sustainability (Wlasiuk *et al.*, 2018).

The mode of action involves the upregulation of genes associated with glutamine and glutamate biosynthesis, along with enhanced processes such as ammonia assimilation, nitrogen fixation, amino acid homeostasis, protein secretion, gibberellin biosynthesis, intensified glycolysis, redox (oxidation-reduction) reactions, and intracellular transport mechanisms (Hawerth *et al.*, 2009) and (Hoeberichts *et al.*, 2017).

This study investigates the influence of varying concentrations of Erger® applied alongside calcium nitrate on the induction and enhancement of budburst, vegetative growth and berry set and some of leaves content such (N, P and K) of " Red Roomy " grapevines grown in Minia governorate, Egypt climatic conditions, to explore potential alternatives to hydrogen cyanamide.

## 2. Materials and methods

-This study was conducted over two consecutive seasons (2022 and 2023) to evaluate the use of a new agent, Erger, as a substitute for Dormex (hydrogen cyanamide) on Red Roomy grapevines. A total of 45 ten-year-old grapevines, planted 2×2 meters apart at Tallah village, Minia governorate, were selected.

The vines were head-pruned in mid-January, leaving 72 buds per vine (20 fruiting spurs × 3 buds + 6 replacement spurs × 2 buds). Standard agricultural practices were applied, excluding treatment-related activities. The experiment was arranged in a completely randomized block design (CRBD), involving 15 treatments with three replicates each (one vine per replicate), and Triton B (0.1%) used as a wetting agent in all sprays.

Treatments included control (water only), Dormex (3%), and Erger at two concentrations (3% and 5%), applied alone or combined with calcium nitrate (3%).

### Treatments were achieved as follows

- 1- control (only water).
- 2- dormex was sprayed at a concentration of 3% at 45 days before bud opening.
- 3- Erger was sprayed at a concentration of 3% in 45 days before bud opening (the first spray).
- 4- Erger was sprayed at a concentration of 3% in 30 days before bud opening (the second spray).
- 5- Erger was sprayed at a concentration of 3% at 45 and 30 days before bud opening (first and second spray).
- 6- Erger was sprayed at a concentration of 5% in 45 days before bud opening (the first spray).

- 7- Erger was sprayed at a concentration of 5% in 30 days before bud opening (the second spray).
- 8- Erger was sprayed at a concentration of 5% at 45 and 30 days before bud opening (first and second spray).
- 9- Calcium nitrate ( $\text{CaNO}_3$ ) was sprayed at a concentration of 3% 45 and 30 days before bud opening.
- 10- Erger was sprayed at a concentration of 3% combined with  $\text{CaNO}_3$  at 45 days before bud opening (the first spray).
- 11- Erger was sprayed at a concentration of 3% combined with  $\text{CaNO}_3$  at 30 days before bud opening (the second spray).
- 12- Erger was sprayed at a concentration of 3% combined with  $\text{CaNO}_3$  at 45 and 30 days before bud opening (first and second spray).
- 13- Erger was sprayed at a concentration of 5% combined with  $\text{CaNO}_3$  at 45 days before bud opening (the first spray).
- 14- Erger was sprayed at a concentration of 5% combined with  $\text{CaNO}_3$  at 30 days before bud opening (the second spray).
- 15- Erger was sprayed at a concentration of 5% combined with  $\text{CaNO}_3$  at 45 and 30 days before bud opening (first and second spray).

**Measurements included:**

- Bud opening %.
- Main shoot length and cane thickness
- Leaf nutrient content (N, P, K) from petioles of leaves.

Data were collected following standard procedures and analyzed using ANOVA and LSD tests at the 5% level.

**3. Results and Discussion**

Data represented in Tables (1-3) proved the response of Red Roomy grapevines development (bud opening %, main shoot length and cane thickness) and leaf nutrition (N, P and K).

**3.1. Bud opening percentage**

Regarding the effect of spraying dormex, Erger, calcium nitrate and their combinations on bud opening percentage data shown in Table (1), data indicated that using dormex at a concentration of 3% was effective in increasing bud opening percentage which recorded (97.9, 98.1) respectively in the two experimental seasons. As well as spraying Red Roomy grapevines by Erger at any concentration was effective over the control.

Results also showed that spraying Erger at a concentration of 5% combined with calcium nitrate at a concentration of 3% was more positive effect than spraying Erger or calcium nitrate lonely at any concentration of them with one exception (spraying Erger at a concentration of 5% twice annually) this approved statistically.

Results also indicated that spraying Erger at a concentration of 5% combined with calcium nitrate at a concentration of 3% twice annually had a positive effect than the other treatments as well as spraying with dormex took similar trend. also spraying calcium nitrate lonely was of positive effect than the untreated treatment in the two experiment seasons.

Many researches stated that hydrogen cyanamide temporarily inhibits catalase, an enzyme that breaks down hydrogen peroxide. This causes a transient rise in reactive oxygen species (ROS) like

hydrogen peroxide, which act as signals that trigger bud break. Also Dormex shifts the balance of plant hormones by Reduces levels of abscisic acid (ABA), which maintains dormancy and Promotes cytokinins and gibberellins, which stimulate growth and bud development. As well as Erger acts by simulating the natural biochemical signals that occur at the end of dormancy. These signals promote Breakdown of dormancy by mimicking cold exposure (chilling requirements)

Activation of metabolic processes within the bud, Promotion of cell division and elongation, leading to visible bud swell and eventual budburst.

Our findings are agreeing with those of Rizk *et al.* (1994), Seleem (1996) and Wassel (1997) on Red Roomy. over more on seedless grapevines by Sabry and Abd El-Rahman (2011).

**Table (1). Effect of spraying dormex, Erger and calcium nitrate and their combinations on (bud opening percentage and main shoot length in Roomy Red grapevine during 2022/2023 seasons**

Treatments	Bud opening %		Main shoot length (cm)	
	First season	Second season	First season	Second season
Control	64	65	103.3	103.3
Dormex 3%	97.9	98.1	117.7	119.3
Erger 3% (First Spray)	92.7	93.7	106.7	108.7
Erger 3% (Second Spray)	94.0	94.3	104.3	106.7
Erger 3% (First / Second Spray)	94.3	95.0	107.0	109.0
Erger 5% (First Spray)	94.1	95.3	104.3	106.7
Erger 5% (Second Spray)	94.0	95.4	104.3	106.7
Erger 5% (First / Second Spray)	95.8	96.9	105.7	110.3
Ca No <sub>3</sub> 3%	79.7	81.0	103.0	106.3
Erger 3% + Ca No <sub>3</sub> (First Spray)	95.0	95.7	109.3	112.7
Erger 3% + Ca No <sub>3</sub> (Second Spray)	95.0	95.7	108.0	106.3
Erger 3% + Ca No <sub>3</sub> (First / Second Spray)	96.0	96.2	112.7	114.3
Erger 5% + Ca No <sub>3</sub> (First Spray)	95.9	96.0	107.3	111.0
Erger 5% + Ca No <sub>3</sub> (Second Spray)	95.8	96.1	109.0	109.3
Erger 5% + Ca No <sub>3</sub> (First / Second Spray)	97.8	97.9	117.3	119.3
LSD at 5%	1.6	1.5	7.1	6.9

### 3.2. Vegetative growth

Concerning the effect of dormex, Erger and Calcium nitrate and their combinations on the main shoot length presented in Table (1) data showed that all treatments were of effective than the control. That is approved statistically with a few exceptions.

The obtained data declared that is no significant differences between the date of the spray of Erger if it was spray lonely or combined with calcium nitrate at a concentration of 3%.

The yield data showed that spraying Erger at a concentration of 5% combined with calcium nitrate twice (45 and 30 days before bud opening) was of positive effect than any treatment except spraying dormex.

Results also showed that spraying Red roomy grapevines with dormex was of positive effect than the control. Data also showed that spraying dormex at a concentration of 3% effective than spraying Erger lonely at any concentration except the treatment of spraying Erger at a concentration of 3% twice. Moreover, spraying dormex was of positive effect than spraying vines with calcium nitrate at a concentration of 3%. Data in the second season took similar trend with a few exceptions.

Concerning the effect of dormex, Erger and Calcium nitrate and their combinations on Cane thickness. Data shown in Table (2) From the yield obtained data, Results declared that all treatments are more of Positive effect on increasing Cane thickness except spraying Erger at a concentration of 3% solely if it sprayed in the first, second or in both Spray date of spray (45,30 days before bud opening), Moreover, Data showed that spraying Erger at a Concentration of 5% combined with calcium nitrate at 3% in the twice date of spray was the best treatment in comparison with rest treatments, except spraying dormex at 3% at 45 days before bud opening.

In first season, Data in Table (2) declared that no significant differences between spraying dormex and spraying Erger at 5% combined with Calcium nitrate at 3% in both date of Spraying, on contrary the rest treatments. Data in the second season took similar trend except some treatments.

A lot of research documented that the enhancing of vegetative growth due to that Dormex and Erger allows plants to begin photosynthesis and nutrient uptake sooner, leading to stronger and more rapid shoot growth.

The Present results are in agreement with those obtained by **Ahmed (1993)** on Zin- fandal grapevines, **Sourial *et al.* (1993)** on Roomy red and **El-Shazly (1999)** on Thompson seedless. and on superior grapevines. Moreover, **El-Wahab *et al.* (2006)** on superior grapevines **Abdlhamid (2021)** on Flame seedless.

**Table (2). Effect of spraying dormex, Erger and calcium nitrate and their combinations on (cane thickness and N percentage in leaf of Roomy Red grapevine during 2022/2023 seasons**

Treatments	Cane thickness		N %	
	First season	Second season	First season	Second season
Control	1.00	0.90	1.48	1.77
Dormex 3%	1.77	1.70	2.26	2.31
Erger 3% (First Spray)	1.27	1.27	1.80	1.95
Erger 3% (Second Spray)	1.17	1.30	1.84	1.91
Erger 3% (First / Second Spray)	1.23	1.20	1.91	1.90
Erger 5% (First Spray)	1.33	1.37	1.84	1.93
Erger 5% (Second Spray)	1.20	1.27	1.87	1.85
Erger 5% (First / Second Spray)	1.43	1.33	1.92	1.81
Ca No <sub>3</sub> 3%	1.13	1.30	2.33	2.37
Erger 3% + Ca No <sub>3</sub> (First Spray)	1.47	1.30	2.27	2.30
Erger 3% + Ca No <sub>3</sub> (Second Spray)	1.47	1.23	2.25	2.26
Erger 3% + Ca No <sub>3</sub> (First / Second Spray)	1.23	1.47	2.36	2.29
Erger 5% + Ca No <sub>3</sub> (First Spray)	1.43	1.37	2.31	2.23
Erger 5% + Ca No <sub>3</sub> (Second Spray)	1.33	1.20	2.24	2.27
Erger 5% + Ca No <sub>3</sub> (First / Second Spray)	1.77	1.68	2.31	2.35
LSD at 5%	0.33	0.37	0.63	0.66

### 3.3. Concerning the Effect of dormex, Erger, Calcium nitrate and their combinations on leaf Content of Roomy Red grapevines

With regard to the impact of dormex, Erger and calcium nitrate and their combinations on leaf content of (N, P, and K) listed in Tables (2 and 3) showed that prementioned nutrients were considerably increased by treating Roomy Red by Dormex (2.31, 2.26) for Nitrogen, (0.22, 0.23) for Phosphor and (1.23 ,1.24) for potassium during two successive seasons.

It was observed that spraying vines with a combination of Erger and calcium nitrate regardless of the Erger concentration had a more positive effect than spraying with either Erger or calcium nitrate alone. This difference was statistically significant. Moreover, no significant differences were found among the various combinations of Erger concentrations with calcium nitrate, nor between the different spray dates. These findings were also statistically confirmed.

Regarding the effect of spraying Dormex, Erger, calcium nitrate, and their combinations on phosphorus (P) leaf content, the data presented in Table 4 during the 2022 and 2023 seasons illustrate the observed outcomes.

In the first season, spraying Dormex at a concentration of 3% showed a greater effect than the control, similar to the effect of spraying Erger at a concentration of 5%. In contrast, spraying Erger at 3% showed no significant improvement compared to the control.

The data also revealed that applying Erger at 5% combined with calcium nitrate resulted in better outcomes than using Erger at 3% with calcium nitrate, and both combinations performed better than the control.

**Table (3). Effect of spraying dormex, Erger and calcium nitrate and their combinations on (P and K percentage) in leaf of Roomy Red grapevine during 2022/2023 seasons**

Treatments	P%		K %	
	First season	Second season	First season	Second season
Control	0.15	0.15	1.16	1.18
Dormex 3%	0.22	0.23	1.23	1.24
Erger 3% (First Spray)	0.17	0.17	1.16	1.18
Erger 3% (Second Spray)	0.16	0.19	1.17	1.20
Erger 3% (First / Second Spray)	0.17	0.18	1.17	1.20
Erger 5% (First Spray)	0.20	0.21	1.20	1.22
Erger 5% (Second Spray)	0.18	0.18	1.18	1.19
Erger 5% (First / Second Spray)	0.19	0.20	1.20	1.21
Ca No <sub>3</sub> 3%	0.21	0.22	1.22	1.23
Erger 3% + Ca No <sub>3</sub> (First Spray)	0.17	0.18	1.18	1.19
Erger 3% + Ca No <sub>3</sub> (Second Spray)	0.15	0.17	1.17	1.18
Erger 3% + Ca No <sub>3</sub> (First / Second Spray)	0.16	0.17	1.17	1.18
Erger 5% + Ca No <sub>3</sub> (First Spray)	0.20	0.21	1.21	1.22
Erger 5% + Ca No <sub>3</sub> (Second Spray)	0.20	0.21	1.21	1.22
Erger 5% + Ca No <sub>3</sub> (First / Second Spray)	0.22	0.23	1.23	1.24
LSD at 5%	0.03	0.02	0.02	0.02



In conclusion, treating Roomy Red vines with either Dormex or Erger at 5% whether applied alone or in combination with calcium nitrate at 3%—had a more positive effect than the other treatments. Furthermore, the timing of the spray had no significant impact on the results.

Our findings are in agreement with those of **El-Shazly (1999)** on Thompson Seedless grapes and **El-Agamy *et al.* (2004)** on Roomy red, **Abd El-All (1996)** on superior. Similar results were observed on paneer variety grape by **Swathi *et al.* (2019)**.

Data regarding the effect on potassium (K) leaf content are presented in Table (3). Based on the yield data, results indicated that spraying Dormex at a concentration of 3% and calcium nitrate at 5% whether applied alone or in combination with Erger at 5% were more effective than the other treatments, including the control.

Moreover, the data revealed that the timing of the application had no significant effect on potassium (K) leaf content in Roomy Red grapevines. Additionally, the lowest concentration of Erger, whether used alone or in combination with calcium nitrate produced results similar to the control.

In the second season, the results followed a similar trend, with only a few exceptions. Dormex enhancing the plant's ability to absorb nutrients from the soil and improving photosynthetic efficiency and nutrient uptake. Erger. Can result in improving photosynthesis and improved nutrient uptake and metabolism. With synchronized growth, vines may show better nutrient allocation, including in the leaves.

These findings are consistent with those reported by **El-Shazly (1999)** and **El-Ghany *et al.* (2001)**; **Deieu and El Alem (2008)** on Thompson Seedless grapevines on Thompson Seedless grapes. Similar results noticed on flame seedless by **Abdlhamid (2021)** and **Mekawy (2008)** on Red roomy grapevines.

As a conclusion spraying Red Roomy grapevines with Erger at a concentration of 5% combined with calcium nitrate at a concentration of 3% twice annually (45 and 30 days before bud opening) gave highly bud opening percentage with a best vegetative growth as well as spraying dormex at a concentration of 3% for a safe environment and a less toxicity, spraying Erger is recommended.

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## تأثير استخدام بعض المواد كاسرة السكون كالدورميكس و الارجر على النمو الخضري لكرمات العنب الرومي الأحمر

عبد الحميد واصل - علي حسن علي - عبد الرحمن مصطفى عبد الوهاب - ولاء محمد عاشور

قسم البساتين - كلية الزراعة - جامعة المنيا - مصر

### الموجز

يهدف هذا البحث إلى دراسة تأثير بدائل آمنة لمادة الهيدروجين سياناميد (Dormex)، المحظورة في بعض الدول بسبب سميتها العالية، على كسر سكون البراعم وتحسين النمو الخضري لعنب "الرومي الأحمر" تحت ظروف محافظة المنيا بمصر. تم اختبار مادة Erger® (منشط حيوي يحتوي على نيتروجين عضوي وكربوهيدرات) بتركيزين (3% و 5%) بمفردها أو مضافاً إليها نترات الكالسيوم (3%)، مع توقيتات رش مختلفة (45 و 30 يوماً قبل تفتح البراعم). أجريت هذه الدراسة على مدار موسمين متتاليين 2023/2022 لتقييم استخدام "إرجر" كبديل لمادة "دورمكس" (سياناميد الهيدروجين) على كروم العنب من صنف "ريد رومي". تم اختيار 45 شجرة عنب بعمر عشر سنوات مزروعة على مسافات 2×2 متر في قرية تلة بمحافظة المنيا. تم تقليم الكرمات تقليماً رأسياً في منتصف شهر يناير، مع ترك 72 عِناً على كل شجرة (20 حامل ثمري × 3 عيون + 6 دوابر تجديد × عيين). نُفذت التجربة وفق تصميم القطاعات الكاملة العشوائية (CRBD)، وشملت التجربة 15 معاملة بثلاث مكررات (شجرة واحدة لكل مكررة)، مع استخدام مادة Triton B بنسبة 0.1% كمادة ناشرة. وأظهرت النتائج أن ميعاد الرش لم يؤثر بشكل كبير على الصفات المدروسة كما أدى رش الدورميكس بتركيز 3% أو الارجر بتركيز 5% مع نترات الكالسيوم 3% إلى زيادة نسبة تفتح البراعم وتحسين النمو الخضري ومحتوى الأوراق من العناصر الغذائية (النيتروجين والفوسفور والبوتاسيوم). وكان رش الارجر مرتين سنوياً (قبل التفتح بـ 45 و 30 يوماً) مع نترات الكالسيوم من أنجح المعاملات. وأظهر الدورميكس فاعلية عالية لكنه يبقى خياراً أقل أماناً مقارنة بالارجر. ويُوصى باستخدام الارجر بتركيز 5% مع نترات الكالسيوم بتركيز 3% كبديل آمن وفعال للدورميكس لتحسين تفتح البراعم والنمو الخضري لعنب "الرومي الأحمر" في المناطق الدافئة.