Invigoration of Katokkon chili (*Capsicum chinense* Jacq.) seeds using halopriming and duration of immersion

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Abstract. A study was carried out to study the response of katokkon seeds to invigoration treatment using atonic substances, phosphoric acid, and KCl. This research was conducted in the form of an experiment using a randomized block design (RBD) 21. Invigoration treatments were given consisting of a combination of atonic substances, phosphoric acid and KCl with different immersion times. The results showed that the invigoration treatment package on the seeds that gave the best effect on the germination and vigor of the chili seeds was the best percentage value of sprouts, namely the package with atonic solution with a soaking time of 6 hours (75%), the percentage value of the vigor index, namely the package with long atonic solution immersion for 6 hours (95.00). Plumula length with a package consisting of a 6 hour immersion phosphoric acid solution with a plumule length (0.24 cm), a radicle length with a package consisting of 3 hours immersion atonic solution with a radicle length (0.51 cm), plant height with a package consisting of acidic solution Phosphate immersion 3 hours with high (9.49 cm), and long roots with a package consisting of a 12 hour long immersion atonic solution (14.02 cm).

1. Introduction
Katokkon chili (*Capsicum chinense* Jacq.) is a type of local chili in Toraja, South Sulawesi. Katokkon chili is favoured by the Toraja people because it has a spiciness level that can be four times that of the usual cayenne pepper. One type of chili in Indonesia that has high economic potential but has not been widely explored and identified is the katokkon chili variety. Katokkon chili has the potential in developing the business and industry for processed ingredients such as sauces and powdered chilies. This plant grows well in the tropics and is widely cultivated in the highlands of Tana Toraja and Enrekang Regencies, South Sulawesi [1, 2].

The advantages of Katokkon chili that have a fragrant aroma and a high level of spiciness, making it a favourite food ingredient in Tana Toraja, especially for fans of spicy flavours. This extraordinary spicy taste is what makes the price quite high in the market. According to Ortega [3] that cayenne pepper (*Capsicum frutescens* L.) contains capsaicin essential oil, a substance that responsible for the hot and spicy taste in chili which also is attributed to Katokkon chili.

The impact of the above problems is a decrease in the quality of local seeds due to decreased viability and vigor, low production that in turn have an impact on yields, profits from production and lower prices. A decrease in the quality of the seeds will have an impact on the quality of the seeds themselves, quality seeds, namely seeds that have good genetic, physiological and physical qualities. One of the things that causes the decline in seed quality is the improper way of storing seeds. This will increase the rate of deterioration, so that the viability consisting of germination and vigor of the seeds quickly decreases [4].
Seed invigoration is the treatment given to seeds prior to planting with the aim of improving germination and germination growth. Seed invigoration can be carried out by immersing the seeds in water, priming with various solutions and using matric-conditioning [5]. Priming is a seed invigoration technique which is a process that controls the hydration process of seed dehydration for metabolic processes prior to germination [6, 7]. One way to improve seed quality, including seed viability and vigor, is to use seed priming technology. The use of seed priming technology can accelerate the growth of sprouts so that they are better, more uniform seed growth, more vigorous seeds, better final tolerance, faster flowering, earlier harvests and higher yields.

Based on the previous description, a research on seed priming was carried out on the Katokkon chili plant. The substances used in seed priming are atonic substances, phosphoric acid, and KCl. So that in this agent it will be seen which seeds can improve their quality and which ones are best used and which substances have the most influence on seed and germination with the local varieties of Katokkon Chili in Toraja.

2. Methodology
This research was in the form of an experiment consisting of the priming stage which was carried out at the Biofertilizer Laboratory and Green House, Department of Agricultural Cultivation, Faculty of Agriculture. The first research was conducted in June-August 2018. Materials used in this research include Katokkon chili seeds, label paper, planting media (compost, soil and husk charcoal), water, atonic, KCl, phosphoric acid, manure, distilled water, filter paper, cocopeat, sand, roasted husk, paper straws, and 15 pieces of chipped plastic measuring 8x12. The tools used in this study included knives, scissors, tweezers, needles, rulers, pencils, analytical scales, petri dishes, aerators, 1000 ml measuring flasks, measuring cups, digital cameras and writing instruments.

This research was conducted in the form of a randomized block design (RBD) and orthogonal contrast test using the SPSS v. 20 application with a treatment package, namely the type of priming solution and immersion time (P). This research is a factor consisting of 21 treatments, namely:

\[ p_0 = \text{water (control)} \]
\[ p_1 = 1 \text{ mL} / \text{L atonic solution with immersion time of 1 hour} \]
\[ p_2 = 1 \text{ mL} / \text{L atonic solution with immersion time of 3 hours} \]
\[ p_3 = 1 \text{ mL} / \text{L atonic solution with immersion time of 6 hours} \]
\[ p_4 = 1 \text{ mL} / \text{L atonic solution with immersion time of 12 hours} \]
\[ p_5 = 1 \text{ mL} / \text{L of phosphoric acid solution with immersion time of 1 hour} \]
\[ p_6 = 1 \text{ mL} / \text{L of phosphoric acid solution with immersion time of 3 hours} \]
\[ p_7 = 1 \text{ mL} / \text{L of phosphoric acid solution with immersion time of 6 hours} \]
\[ p_8 = 1 \text{ mL} / \text{L of phosphoric acid solution with immersion time of 12 hours} \]
\[ p_9 = 1 \text{ mL} / \text{L atomic solution + phosphoric acid with immersion time of 1 hour} \]
\[ p_{10} = 1 \text{ mL} / \text{L atomic solution + phosphoric acid with immersion time of 3 hours} \]
\[ p_{11} = 1 \text{ mL} / \text{L atomic solution + phosphoric acid with immersion time of 6 hours} \]
\[ p_{12} = 1 \text{ mL} / \text{L atomic solution + phosphoric acid with immersion time of 12 hours} \]
\[ p_{13} = 40\% \text{ KCl solution with immersion time of 1 hour} \]
\[ p_{14} = 40\% \text{ KCl solution with immersion time of 3 hours} \]
\[ p_{15} = 40\% \text{ KCl solution with a soaking time of 6 hours} \]
\[ p_{16} = 40\% \text{ KCl solution with immersion time of 12 hours} \]
\[ p_{17} = 60\% \text{ KCl solution with immersion time of 1 hour} \]
\[ p_{18} = 60\% \text{ KCl solution with immersion time of 3 hours} \]
\[ p_{19} = 60\% \text{ KCl solution with immersion time of 6 hours} \]
\[ p_{20} = 60\% \text{ KCl solution with immersion time of 12 hours} \]

Each treatment package was repeated 3 times so that there were 63 treatment package units. Each treatment package consists of 5 units so that there are 315 observation units.
3. Results and discussion

3.1. Germination Capacity (GC)
Analysis of variance for the treatment of atonic, phosphoric acid, atonic and phosphoric acid, KCl 40% and KCl 60% with different immersion time of 1 hour, 3 hours, 6 hours, and 12 hours show that there was a difference in the germination capacity for each treatment with different seed priming time ranges. The average value of the percentage of germination capacity shows the highest value of 75% (table 1).

Table 1. Germination Capacity (%) of Katokkon chili at different seed priming and immersion duration.

| Immersion time (hour/s) | Priming solution                  |
|-------------------------|-----------------------------------|
|                         | Atonic                        | Phosphoric acid | Atonic + phosphoric acid | KCl 40% | KCl 60% |
| p0 (kontrol)            | 37.50                          |                 |                         |         |         |
| 1                       | 42.50                          | 65.00           | 42.50                   | 47.50   | 47.50   |
| 3                       | 50.00                          | 57.50           | 45.00                   | 45.00   | 42.50   |
| 6                       | 75.00                          | 40.00           | 55.00                   | 45.00   | 50.00   |
| 12                      | 60.00                          | 35.00           | 65.00                   | 50.00   | 50.00   |

Table 1 shows that the seed priming treatment at various immersion periods produced higher germination rates than the control. In the seed priming treatment using atonic solution for 6 hours produced the highest percentage of germination compared to other treatments. The table above can also show that there is a tendency for the percentage of germination to increase with an increase in immersion time of up to 6 hours. However, it decreased at 12 hours of immersion. Atonic treatment and immersion time produced a higher percentage compared to the control. This means that the results obtained have a good effect compared to the control (p0) with a value of 60.00%.

3.2. Seed Vigor Index
Observation data for the seed vigor index (attachment 2a) shows a good value for the results of the observations that have been made, the average percentage value shows the highest value 80% to 100% indicating optimal germination. And the lowest value is 55% (p0) control, low value because the seeds are not priming.

Table 2. Vigor index of Katokkon chili at different seed priming and immersion duration.

| Immersion time (hour/s) | Priming solution                  |
|-------------------------|-----------------------------------|
|                         | Atonic                        | Phosphoric acid | Atonic + phosphoric acid | KCl 40% | KCl 60% |
| p0 (kontrol)            | 55.00                          |                 |                         |         |         |
| 1                       | 85.00                          | 100             | 80.00                   | 80.00   | 80.00   |
| 3                       | 82.50                          | 95.00           | 100                     | 100     | 100     |
| 6                       | 95.00                          | 100             | 100                     | 95.00   | 92.50   |
| 12                      | 92.50                          | 92.50           | 100                     | 100     | 100     |

Table 2 shows that the seed priming treatment at various immersion periods resulted in a higher vigor index than the control. In the seed priming treatment using atonic solution, the soaking time for 6 hours resulted in the best seed vigor index value. The same thing is also produced in seed priming using a solution of phosphoric acid and a mixture of atonic + phosphoric acid. Seed priming using a mixture of
atonic + phosphoric acid, tended to produce a higher seed vigor index at immersion times of 3, 6, and 12 hours compared to other seed priming treatments. In the seed priming treatment using KCl 40 or 60% solutions, the highest seed vigor index values were produced at 3 hours and 12 hours of immersion time.

3.3. Plumule length
Analysis of variance shows that seed priming and duration of immersion of Katokkon seeds significantly affect the growth of plumule. Results of orthogonal contrast between treatments are shown in table 3.

| Treatments | Average | Sig. |
|------------|---------|------|
| p0 vs p1 vs p2 vs p3 vs p4 | 0.23 vs 0.30 | ns |
| (p1-p12) vs (p13-p20) | 0.27 vs 0.33 | * |
| (p1-p4) vs (p5-p12) | 0.26 vs 0.29 | ns |
| (p13-p16) vs (p17-p20) | 0.37 vs 0.29 | ns |
| p1 vs p2 vs p3 vs p4 | 0.24 vs 0.24 | ns |
| p1 vs p2 vs p3 vs p4 | 0.25 vs 0.23 | ns |
| p3 vs p4 vs p5 vs p6 vs p7 vs p8 | 0.19 vs 0.27 | ns |
| p5 vs p6 vs p7 vs p8 | 0.23 vs 0.24 | ** |
| p9 vs p10 vs p11 vs p12 | 0.24 vs 0.27 | ns |
| p9 vs p10 vs p11 vs p12 | 0.16 vs 0.27 | ns |
| p11 vs p12 vs p13 vs p14 vs p15 vs p16 | 0.23 vs 0.10 | ns |
| p13 vs p14 vs p15 vs p16 | 0.10 vs 0.11 | ns |
| p13 vs p14 vs p15 vs p16 | 0.11 vs 0.09 | ns |
| p15 vs p16 vs p17 vs p18 vs p19 vs p20 | 0.11 vs 0.10 | ns |
| p17 vs p18 vs p19 vs p20 | 0.23 vs 0.12 | ** |
| p17 vs p18 vs p19 vs p20 | 0.07 vs 0.16 | ns |
| p19 vs p20 vs p21 vs p22 | 0.06 vs 0.09 | ns |

Orthogonal contrast test values for Sig. (2-tailed) <0.05.
ns : not significant.
** : very significant.

Table 3 shows that the administration of growth regulators atonic, phosphoric acid, atonic + phosphoric acid, KCl 40 and KCl 60% (p0 vs p1-p20) with a value of p> 0.05, which means there is a difference in plumule length between treatments and controls. The administration of atonic, phosphoric, atonic + phosphoric acid, KCl 40% and KCl 60% resulted in plumule length (0.30 cm) and was very significantly different from the control (p0) which only increased (0.23 cm). The treatment with KCl 40% and KCl 60% (p13-p20) resulted in a length of plumule with a value (0.33 cm) and significantly different from the treatment of atonic, phosphoric, atonic + long phosphoric acid with a value of (0.27 cm). Phosphoric acid treatment with immersion for 3 hours (p6) resulted in plumule length with a value (0.24 cm) and was very significantly different from phosphoric acid treatment with 1 hour immersion (p5) which resulted in plumule length (0.23 cm). And 60% KCl treatment with immersion time of 6 and 12 hours (p19p20) which resulted in a length of plumule with a value (0.12 cm) and was very significantly different from 60% KCl treatment with immersion time of 1 and 3 hours (p17p18) which resulted in plumule length (0.23 cm).
3.4. Radicle length
Analysis of variance shows that treatment of seed priming and immersion time had very significant effect on the length of radicle. The contrast test results in table 4 shows that the use of atonic solutions, phosphoric acid, atonic phosphoric acid, KCl 40%, and KCl 60% (po vs p1-p20). Treatment with KCl 40% and KCl 60% (p13-p20) resulted in a radicle length with a value (0.62) and was significantly different from the treatment of atonic, phosphoric, atonic + phosphoric acid (p1-p12) resulted in the length of the radicle with a value (0.48cm).

Table 4. Results of orthogonal contrast test on radicle length (cm).

| Treatments                     | Average | Sig. |
|--------------------------------|---------|------|
| p0 vs p1p2p3p4                 | 0.31 vs 0.55 | ns   |
| (p1-p12) vs (p13-p20)          | 0.48 vs 0.62 | *    |
| (p1-p4) vs (p5-p12)            | 0.53 vs 0.44 | **   |
| (p13-p16) vs (p17-p20)         | 0.87 vs 0.37 | ns   |
| p1p2 vs p3p4                   | 0.39 vs 0.37 | ns   |
| p1 vs p2                       | 0.36 vs 0.38 | ns   |
| p3 vs p4                       | 0.51 vs 0.20 | **   |
| p5p6 vs p7p8                   | 0.47 vs 0.29 | ns   |
| p5 vs p6                       | 0.31 vs 0.38 | ns   |
| p7 vs p8                       | 0.34 vs 0.42 | ns   |
| p9p10 vs p11p12                | 0.30 vs 0.39 | ns   |
| p9 vs p10                      | 0.51 vs 0.34 | ns   |
| p11 vs p12                     | 0.31 vs 0.22 | ns   |
| p13p14 vs p15p16               | 0.24 vs 0.20 | ns   |
| p13 vs p14                     | 0.21 vs 0.26 | ns   |
| p15 vs p16                     | 0.20 vs 0.21 | ns   |
| p17p18 vs p19p20               | 0.31 vs 0.22 | ns   |
| p17 vs p18                     | 0.18 vs 0.26 | ns   |
| p19 vs p20                     | 0.16 vs 0.20 | ns   |

Orthogonal contrast test values for Sig. (2-tailed) <0.05.
ns : not significant, * : significant, ** : very significant.

Treatment with phosphoric acid, atonic + phosphoric acid (p5-p12) resulted in a value (0.44 cm) and was very significantly different from atomic treatment (p1-p4) resulting in a radicle length of value (0.53 cm). Phosphoric acid treatment with immersion time of 12 hours (p4) resulted in a radicle length with a value (0.20 cm) which was very significantly different from atomic treatment with immersion time of 6 hours (p3) resulting in a radicle length with a value (0.51 cm).

3.5. Plant height 32 days after sowing (DAS)
Plant height at 32 DAS significantly affected by the seed priming compounds and the duration of the immersion of the seeds. The contrast test results in table 5 shows that the use of atonic solutions, phosphoric acid, atonic + phosphoric acid, KCl 40%, and KCl 60% (po vs p1-p20). Treatment with atomic, phosphoric acid, atonic + phosphoric acid, KCl 40% and KCl 60% (p1-p20) resulted in plant height with a value (7.73 cm) which was very significantly different from the control (p0) which produced plant height with a value (6.92 cm). Treatment of KCl 40% and KCl 60% (p13-p20) which resulted in plant height with a value (8.27 cm) which was significantly different from the treatment of atomic, phosphoric, atonic + phosphoric acid (p1-p12) which produced plant height with a value (7.18 cm). The treatment of phosphoric acid, atonic + phosphoric acid (p5-p12) resulted in plant height with
a value (7.63 cm) which was significantly different from that of atonic treatment (p1-p4) which resulted in plant height with a value (6.73 cm). KCl treatment 60% (p17-p20) which resulted in plant height with a value (8.45 cm) that was significantly different from KCl treatment 40% (p13-p16) which resulted in plant height with a value (8.09 cm).

**Table 5.** Results of orthogonal contrast test on plant height (cm) at 32 DAS.

| Treatments                | Average  | Sig. |
|---------------------------|----------|------|
| p0 vs (p2-p21)            | 6.92 vs 7.73 | **   |
| (p1-p12) vs (p13-p20)     | 7.18 vs 8.27 | *    |
| (p1-p4) vs (p5-p12)       | 6.73 vs 7.63 | *    |
| (p13-p16) vs (p17-p20)    | 8.09 vs 8.45 | *    |
| p1p2 vs p3p4              | 11.32 vs 12.45 | *  |
| p1 vs p2                  | 11.47 vs 13.43 | *  |
| p3 vs p4                  | 10.90 vs 12.04 | *  |
| p5p6 vs p7p8              | 13.87 vs 12.99 | **  |
| p5 vs p6                  | 6.92 vs 9.49 | **  |
| p7 vs p8                  | 8.73 vs 10.24 | ns  |
| p9p10 vs p11p12           | 8.76 vs 8.71 | *   |
| p9 vs p10                 | 10.53 vs 9.95 | ns  |
| p11 vs p12                | 6.92 vs 7.15 | **  |
| p13p14 vs p15p16          | 7.29 vs 7.01 | *   |
| p13 vs p14                | 7.22 vs 7.36 | ns  |
| p15 vs p16                | 6.98 vs 7.03 | ns  |
| p17p18 vs p19p20          | 6.92 vs 6.75 | ns  |
| p17 vs p18                | 6.77 vs 6.74 | ns  |
| p19 vs p20                | 6.80 vs 6.73 | ns  |

Orthogonal contrast test values for Sig. (2-tailed) < 0.05.

ns : not significant, * : significant, ** : very significant.

Atonic treatment with immersion time of 6 hours and 12 hours (p3 and p4) which resulted in plant height with a value (12.45 cm) that was significantly different from the atonic treatment with immersion time of 1 hour and 3 hours (p1 and p2) resulted in plant height with values (11.32 cm). Atonic treatment with immersion time of 3 hours (p2) resulted in plant height with a value (13.43 cm) that was significantly different from the atonic treatment with immersion time of 1 hour (p1) which resulted in plant height with a value (11.47 cm). Atonic treatment with immersion time of 12 hours (p4) which resulted in plant height with a value (12.04 cm) which was significantly different from the atonic treatment with immersion time of 6 hours (p3) which resulted in plant height with a value (10.90 cm). Phosphoric acid treatment with immersion time of 6 hours and 12 hours (p7 and p8) resulted in plant height with a value (13.87 cm) that was very significantly different with phosphoric acid treatment 1 hour and 3 hours (p5 and p6) which resulted in plant height with values (12.99 cm). Phosphoric acid treatment with immersion time of 3 hours (p6) which resulted in plant height with a value (9.49 cm) which was very significantly different from phosphoric acid treatment with immersion time of 1 hour (p5) which resulted in plant height with a value (6.92 cm). The atonic + phosphoric acid treatment with immersion time of 6 hours and 12 hours (p11 and p12) resulted in plant height with a value (8.71 cm) which was significantly different from the atonic + phosphoric acid treatment with immersion time of 1 hour and 3 hours (p9 and p10) which yielded a plant height with a value (8.76 cm). Atonic treatment + phosphoric acid with immersion time of 12 hours (p12) which resulted in plant height with a value (7.15 cm) which was very significantly different from atonic treatment + phosphoric acid with immersion time of 6 hours (p11) which resulted in a height with a value (6.92 cm). The 40% KCl treatment with immersion time
of 6 hours and 12 hours (p15 and p16) resulted in plant height with a value (7.01 cm) that was significantly different from the 40% KCL treatment with immersion time of 1 hour and 3 hours (p13 and p14) which yielded a plant height with a value (7.29 cm).

3.6. Root length

Treatments of seed priming compounds and the duration of the immersion significantly affected the root length of Katokkon. The contrast test results in table 6 show that the use of atonic growth solutions, phosphoric acid, atonic + phosphoric acid, KCl 40 and KCl 60% (p0 vs p1-p20). Treatment with KCl 40 and KCl 60% (p13-p20) resulted in a root length with a value (10.14 cm) that was significantly different from atonic, phosphoric, atonic + phosphoric acid (p1-p12) which resulted in a root length with a value of (10.75). The treatment of phosphoric acid, atonic + phosphoric acid (p5-p12) resulted in a root length with a value (11.01 cm) that was significantly different from the atonic treatment (p1-p4) which resulted in a root length of value (10.48 cm). KCl treatment 60% (p17-p20) which resulted in a root length with a value (9.94 cm) that was significantly different from KCl treatment 40% (p13-p16) which resulted in a root length with a value (10.33 cm). Atonic treatment of 6 hours and 12 hours (p3 and p4) which produced root lengths with values (12.82 cm) that were very significantly different from atonic treatments of 1 and 3 hours (p1 and p2) which produced root lengths with values (12.29 cm). The 12 hours atonic treatment (p4) resulted in a root length with a value (14.02 cm) and very significantly different from the 6 hours atonic treatment (p3) which resulted in a root length with a value (13.14 cm).

Table 6. Results of orthogonal contrast test on root length.

| Treatments | Average | Sig. |
|------------|---------|------|
| p0 vs p1p2p3p4 | 10.19 vs 10.44 | ns |
| (p1-p12) vs (p13-p20) | 10.75 vs 10.14 | * |
| (p1-p4) vs (p5-p12) | 10.48 vs 11.01 | * |
| (p13-p16) vs (p17-p20) | 10.33 vs 9.94 | * |
| p1p2 vs p3p4 | 12.29 vs 12.82 | ** |
| p1 vs p2 | 13.58 vs 12.07 | ns |
| p3 vs p4 | 13.14 vs 14.02 | ** |
| p5p6 vs p7p8 | 12.07 vs 12.07 | * |
| p5 vs p6 | 10.19 vs 11.67 | ** |
| p7 vs p8 | 11.53 vs 11.81 | ns |
| p9p10 vs p11p12 | 10.67 vs 12.4 | ns |
| p9 vs p10 | 10.71 vs 12.92 | * |
| p11 vs p12 | 10.19 vs 8.84 | ** |
| p13p14 vs p15p16 | 8.52 vs 8.44 | ns |
| p13 vs p14 | 8.49 vs 8.54 | ns |
| p15 vs p16 | 8.65 vs 8.23 | ns |
| p17p18 vs p19p20 | 10.19 vs 8.02 | ** |
| p17 vs p18 | 7.39 vs 8.65 | ** |
| p19 vs p20 | 7.00 vs 7.79 | ns |

Orthogonal contrast test values for Sig. (2-tailed) <0.05.
ns : not significant, *: significant, **: very significant.

Phosphoric acid treatment for 6 hours and 12 hours (p7 and p8) resulted in a root length with a value (12.07 cm) that was significantly different from the phosphoric acid treatment with a time of 1 hour and 3 hours (p5 and p6) which resulted in a root length with a value (12.82 cm). Phosphoric acid treatment with immersion time of 6 hours (p6) resulted in a root length with a value (11.67 cm) which was
significantly different from phosphoric acid treatment with immersion time of 3 hours (p5) which resulted in a root length with a value (10.19 cm). Atonic treatment + phosphoric acid with immersion time of 3 hours (p10) which resulted in a root length with a value (12.92 cm) which was significantly different from the atonic treatment + phosphoric acid with immersion time of 1 hour (p9) which resulted in a root length with a value (10.71 cm). Atonic + phosphoric acid treatment with immersion time of 12 hours (p12) which resulted in a root length with a value (8.84 cm) which was very significantly different from atonic treatment + phosphoric acid with immersion time of 6 hours (p11) which resulted in a root length of value (10.19 cm). The 60% KCl treatment with immersion time of 6 hours and 12 hours (p19 and p20) resulted in an increase in root length with a value (8.02 cm) which was very significantly different from the KCl treatment of 60% 1 hour and 3 hours (p17 and p18) which produced length root with the value (10.19 cm). The 60% KCl treatment with immersion time of 3 hours (p18) resulted in a root length of value (8.65 cm) and was very significantly different from 60% KCl treatment with 1 hour immersion time (p17) which resulted in a root length of value (7.39 cm).

4. Discussion

In this study, using several treatments atonic, phosphoric acid, atonic + phosphoric acid, KCl 40%, KCl 60%, control. From each treatment observed, it shows that there are differences from one another from the treatments used as well as differences in time that will be compared with the control, so that it can be seen that the treatment is significantly different, very real, and not significantly different compared to the control. This study used four different time durations, namely 1 hour, 3 hours, 6 hours, and 12 hours, which were influential compared to those who were not treated at all or in other words control.

The results showed that treatment with different types of solutions could affect the germination capacity of Katokkon chilies. Likewise, the immersion time also greatly affects germination. The observations for the sprouting power of Katokkon chilies showed that the treatment using atonic, phosphoric acid, atonic + phosphoric acid, KCl 40%, and KCl 60%, from each treatment observed, it shows that there are differences from one another from the treatments used as well as differences in time that will be compared with the control, so that it can be seen that the treatment is significantly different, very real, and not significantly different compared to the control. This study used four different time durations, namely 1 hour, 3 hours, 6 hours, and 12 hours, which were influential compared to those who were not treated at all or in other words control.

In the way it works, atonics are quickly absorbed by plants and stimulate the protoplasmatic flow of cells and accelerate germination and rooting, but if the concentration is excessive it can inhibit growth. Atonic is one of the biological stimulants as a bio stimulant that can stimulate plant growth, accelerate the recovery of injured plant parts and increase the quality and quantity of crop yields. Atonik contains active ingredients sodium mono nitroquaiacol 2-(CH$_3$O) (C$_6$H$_4$OH) and aromatic nitro compound. Nitro compounds are organic components that contain more than one -NO$_2$ functional group. Atonic has properties that can trigger seed growth, shoot rooting and increase fertilization or crop yield [10].

Treatment using phosphoric acid solutions is often used to break dormancy in seeds. The aim is to make the seed coat or seed more easily absorbed by water during the imbibition process. Strong acid solutions such as phosphoric acid (H$_3$PO$_4$) are often used in varying concentrations to be concentrated, so that the seed coat becomes soft. Besides that, this solution that is used can also kill the fungi or bacteria that can make the seeds dormant. The phosphoric acid treatment used can free hydrophilic colloids so that the imbibition pressure increases and will increase seed metabolism [11].
Use of KCl compounds is important because the K nutrient plays a role in both vegetative and generative growth [12]. The size of the endosperm of the seeds, especially the carbohydrates formed in the seeds, is the result of accumulation of assimilates during photosynthesis. The main carbohydrate in sorghum seeds is in the form of starch [13]. Previous study had shown that the use of soaking time of 12 hours on hydropriming and 24 hours of GA3 and PEG priming was found to be the most effective in increasing germination and growth of chili seedlings.

5. Conclusion
Based on the results of the research that has been carried out, it can be concluded that there is a package of seeds that has the best effect on germination and vigor of chili seeds. The best value of the percentage of germination power is the package with atonic solution with immersion time of 6 hours (75%). The percentage value of the vigor index is the package with atonic solution with immersion time of 6 hours (95.00). Plumule length with a package consisting of a 6 hour immersion phosphoric acid solution with a plumule length (0.24 cm), the length of the radicle with a package consisting of 3 hours of immersion in atonic solution with a radicle length (0.51 cm), plant height with a package consisting of a solution of phosphoric acid immersion for 3 hours with a height (9.49 cm), and long roots with a package consisting of atonic solution of immersion for 12 hours with a length (14.02 cm).

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