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RESEARCH ARTICLE

SEED GERMINATION OF TOMATO (*Solanum lycopersicum*) USING PAPAYA (*Carica Papaya* L.) FRUIT EXTRACTS AS NATURALLY OCCURRING GERMINATION INHIBITOR AND GIBBERELLIC ACID IN VARIOUS SEED TREATMENTS

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Abstract

Seed Germination is a vital process in plant growth and development. It is very crucial in crop production. Control of seed germination can proceed if there are presence of naturally occurring germination inhibitors such as papaya fruit extracts. Promotion of seed germination on the other hand, can be obtain from plant growth hormones such as gibberellic acid. Various seed treatments used in the experiment were the following: T1-unwashed, fresh; T2-washed, fresh; T3-washed, air-dried; T4-washed, fresh and T5-washed, fresh.Twenty (20) seeds were counted for each treatment. Distilled water as the germinating medium for the seeds were T1, T2 and T3. In T4 and T5, 100ppm of GA_3 and papaya fruit extracts were used as germinating media respectively. The highest and the lowest percent germination was shown in T2 and T5 respectively.InT1 and T3 on the other hand, had 75% and 80% germination respectively.Papaya fruit extracts (T5) is considered as a naturally occurring germination inhibitorin tomato.

Introduction:-

A dormant seed is the inability of the seed to germinate in a specifiedtime under a combination of environmental factors that are normally suitable for the germination of the non-dormant seed(1). Dormancy is a mechanism to prevent germination during unfavorable environmental conditions and when the probability of seedling survival is low(2). Seed germination depends on both internal and external conditions. The most important external factors are the following: right temperature, available water, air (O_2), light or darkness(3).

For some seeds, their future germination response is affected by environmental conditions during seed formation; most often these responses are types of seed dormancy such as endogenous dormancy.Endogenous dormancy is caused by the conditions within the embryo itself and subgroup into physiological and morphological. Physiological dormancy prevents embryo growth and seed germination until chemical changes occur(4).

Promotion of seed germination on the other hand, can be obtain from plant growth hormones such as gibberellic acid.

In this experiment, papaya fruit extracts and gibberellic acid (GA_3) are used in tomato seeds by computing for the percent germination of the various treatments.

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Materials And Methods:-

Test Species

Fresh seeds from ripe tomato fruits were used in the study. Tomato (*Solanum lycopersicum*) is a member of the Solanaceae family. It is anannual plant commonly usedas avegetable crop.

Preparation of different treatments

Twenty (20) tomato seeds from ripe tomato fruits (Figure 1) were prepared for each of the different treatments. The different treatments (Figure 2) were the following: (T1) Unwashed, fresh; (T2) Washed, fresh; (T3) Washed, air dried; (T4) Washed, fresh + 100ppm GA_3 and (T5) Washed, fresh + papaya fruit extract. Each treatment was placed in a small petri dish lined with filter paper and 3ml of distilled water were placed in T1, T2 and T3 while 3ml of 100ppm GA_3 and papaya fruit extracts were placed in T4 and T5 respectively. No replication was done in the experiment. The treatments were covered with carbon paper and kept inside the locker for one (1) week.

Gathering of Data

The total number of seeds germinated and ungerminated were countedper treatmentafter a week. For each treatment, the percent germination was determined. The data is shown in Table 1.

Percent Germination

The equation for percent germination (%G) is,

$$\%\,G = \frac{\text{numberofseedsgerminated}}{\text{totalnumberofseeds}} \text{x } 100$$

To be able to determine the effect of the treatments, the total number of seeds germinated was counted. The presence of radicle is considered as germinated seeds in this experiment.

Results And Discussion:-

Table 1:- Effect of washing and air-drying, GA_3 and naturally occurring inhibitor on germination of tomato seeds.

Seed Treatment	Germinating Medium	Number of Seeds		Percent Germination
		Germinated	Ungerminated	
Unwashed, fresh (T1)	H_2O	15	5	75%
Washed, fresh (T2)	H_2O	19	1	95%
Washed, air dried (T3)	H_2O	16	4	80%
Washed, fresh (T4)	100 ppm GA_3	13	7	65%
Washed, fresh (T5)	papaya fruit extract	4	16	20%

Photos and BarGraph

Figure 1shows the tomato seeds used in the experiment. Figure 2 shows all the treatments as seen in Table 1. Figure 3 shows the bar graph of thepercent germinationfor various seed treatment.

In this figure (Figure 1), freshly ripe tomato fruits were used to identify the effect of naturallyoccurring germination inhibitors on the germination of tomato seeds.

Figure 1:-Tomato seeds from ripe fruits.

Twenty(20)seeds were counted for each treatment as shown in Figure 2. All the seeds were washed with water except for T1 and the mucilages on the seeds were all removed. Distilled water as the germinating medium for the seeds were T1, T2 and T3. The only treatment that was air dried is T3. In T4 and T5, 100ppm of GA_3 and papaya fruit extracts were used as germinating mediarespectively. After the photo documentation, all the petri dishes were covered with carbon paper and kept inside the locker for one week.

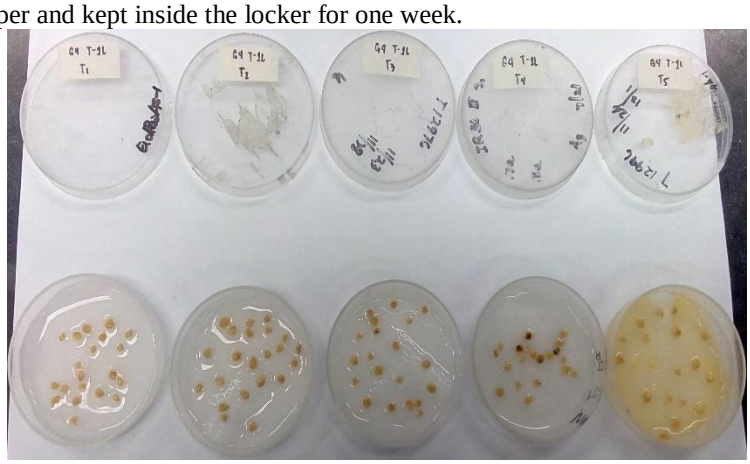

Figure 2:- Different tomato seed treatments.

The highest and the lowestpercent germination was shown in T2 and T5 respectively.In T1 and T3 on the other hand, had 75% and 80% germination respectively. It is expected that percent germination should be highest in T3 than in T2 because tomato seeds are example of orthodox seeds. Unwashed seeds may decrease the germination because tomato contains compound that inhibits seed germination. The highest level of germination inhibitor in tomato is found in the epicarp (skin) which is the most persistent tissue of the fruit(6). Air drying of seeds affects seed germinationbecause it is directly related to seed longevity (storability). Two major characteristics that control seed quality are seed dormancy and seed longevity.In T5 on the other hand, papaya fruit extractsis considered as a naturallyoccurring germination inhibitor in tomato seeds.Papaya (*Carica papaya*) contains sarcotesta, a fleshy seed coat which surrounds the seeds. Gherardi and Valio (1976) had reported the presence of growth-inhibiting substances in the mucilage covering the seed of papaya. The presence of sarcotesta in papaya fruit extracts inhibits germinationin tomato seeds.GA_3 (T4) at higher concentrations (100ppm) promotes seed germination.It was found that the endosperm isweakened prior to visible germination, which can be ascribed to the activities of a series of hydrolytic enzymes that is stimulated byGA excreted from the radicle tip of the seeds(9). The degree of reduction in the restricting force against the embryo growth, imposed by the endosperm, is the key forcontrol of seed germination(8).

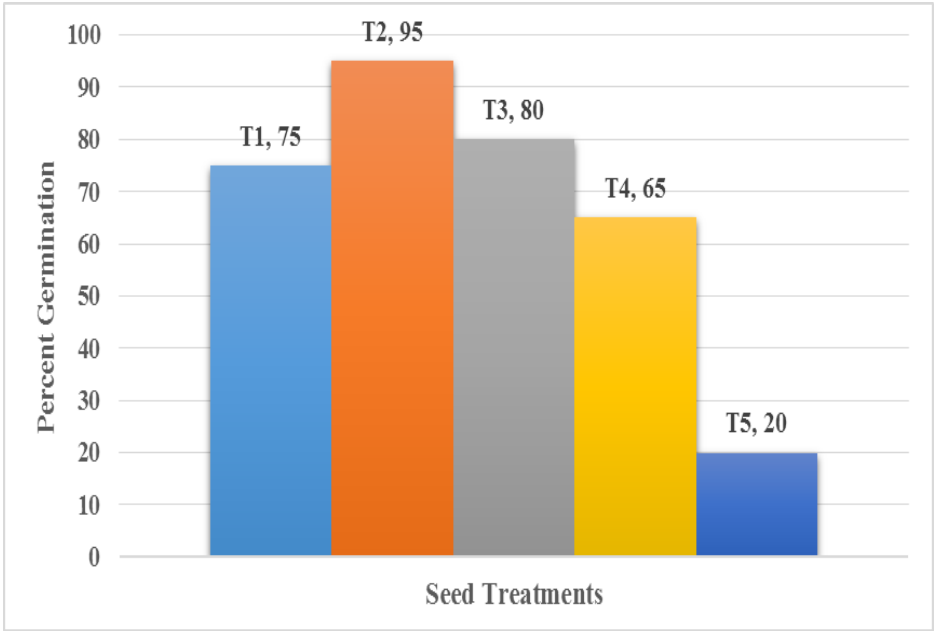

Figure 3:- Percent germination of various tomato seed treatments.

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