The Effect of Gibberellic Acid Upon *Euglena*

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Gibberellic acid is a specific giberellin produced by the fungus *Gibberella fujikuroi*. It is a white powder that requires 15-20 minutes to dissolve in water, and is unstable above room temperature. This chemical, when applied to plants by spray, droplet or paste in varying strengths of 0.1 to 1000 ppm often causes the elongation of the internode and results in faster growth.

Since no literature pertaining to the effects of gibberellic acid on microscopic forms, such as *Euglena*, was found, a hypothesis was formulated that the acid would cause elongation and/or earlier attainment of maximum size, resulting in faster reproduction, by fission, than under natural conditions. Accordingly, an experiment was set up to test this hypothesis.

A food medium was prepared for each experimental culture by adding 6 grains of polished rice to 250 cc. tapwater and boiling for 10 minutes. The medium was allowed to stand for 40 days. One hundred and fifty cc. of the medium was poured in each of seven covered plastic dishes. Gibberellic acid was added to separate dishes in the concentrations of 0.1, 1.0, 10, 100 and 1000 ppm. The other two dishes were used as controls. Each culture was then innoculated with 0.6 cc. of green encysted and active *Euglena*. At the time of innoculation 25 individuals were measured and found to have a mean length of 54.1 microns and a mean width of 13.6 microns. The dishes were placed in a well-lighted window at higher than room temperature.

Forty-eight hours after innoculation, the cultures were examined and 25 individuals from each cultured were measured by means of a Whipple disc. The results of these measurements are summarized in Table I.

Table I. Growth rates of *Euglena* treated with various concentrations of gibberellic acid.

ppm	Range		Mean	
	Length in Microns	Width in Microns	Length in Microns	Width in Microns
Control #1	61.2-45.9	15.3-10.2	52.4	13.0
Control #2	61.2-40.8	15.3-10.2	49.1	12.8
Control #1 + #2			50.7	12.9
Gibberellic acid				
0.1 ppm	61.2-40.8	15.3-10.2	50.5	12.4
1.0 ppm	61.2-45.9	15.3-10.2	54.2	12.6
10 ppm	61.2-35.7	15.3-10.2	50.4	13.4
100 ppm	61.2-45.9	15.3-10.2	52.8	14.0
1000 ppm	70.4-56.1	15.3-10.2	62.8	12.4

The cultures were examined microscopically 10 days after innoculation. The 1.0 ppm culture had no cysts or active individuals, the 100 ppm culture had 3 active individuals, whereas all the other cultures had only dark cysts. No individuals or cysts in any culture showed any green coloration. At this time the culture had an odor of putrification.

The cultures were examined microscopically 8 days later. All the culture again contained only dark cysts except the 1000 ppm culture which contained numerous green cysts and green active individuals.

There appears to be no significant difference between mean lengths of *Euglena* from the different cultures except in the 1000 ppm concentration culture. The mean length in this culture is 12.1 microns or 24 per cent greater than the mean length of those in the two controls, and is 8.7 microns or 16 per cent greater than the mean of those in the original culture used to seed the experiment. The mean width was approximately the same in all cultures. Counts could not be made to determine if there was an increase in numbers because the euglenas were all encysted, except in the 1000 ppm dish.

These results cannot be considered conclusive, since the number of tests and measurements are insufficient. The techniques may need to be modified to prevent putrification and high temperatures which may render the acid inactive.

More experiments are planned to supplement this work. If future experiments prove that this acid will react as suggested, it could possibly have economic value in speeding up cultures, helping to purify polluted waters, and helping to shorten the duration of bloom in water supplies.

In this preliminary experiment, gibberellic acid in a 1000 ppm concentration seems to have caused elongation of *Euglena*, and a possible delayed action of reproduction and chlorosynthesis. In lower concentrations the acid seems to cause formation of dark-clored cysts.

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References

Anon. (n.d.) Gibrel. Merck and Co. Tech. Bull. pp. 1-18 + 188 annotated ref.

Ohrmund, Margaret, James L. Rowe and Curt Leben. 1956. Eli Lilly and Co., Indianapolis, Mimeo. Form 326- 2: 1-8.