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DRY WEIGHT AND CARBOHYDRATE CHANGES IN TOMATO SEEDLINGS GERMINATED IN DARK AND LIGHT

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Organic matter accumulation in seedlings has a great influence on the total life and its products in any varities of crops. As the tomato is day neutral plant it is interesting to examine the behaviour of organic matter accumulation of the seedlings, germinated in dark and light which may have corelation to the end products of this crops.

Mittal et al (1965) observed that tomato seeds germinate, both in light as well as in continious darkness, but the germination percentages was different under light regimes. When the seeds were continiously irradiated for 144 hours the germination was poor, as compared to the germinations in continious darkness.

Nutile et al (1950) are in the opinion that tomato seeds germinated equally well in darkness as well as when exposed to unfiltered light (white fluorescence) under laboratory conditions.

Mayer et al (1963) reported that the initial stages of germinations are consequently accompanied by a net loss of dry weight due to oxidation of substances on one hand and leakage out the seed on the other hand. In case of bean seeds the cotyledons show steady decrease in dry weight for the first four days of germination. At the same time similiar increase in dry weight can be observed in other parts of the seedlings and especially in the hypocotyl. They are also of the opinion that glucose and fructose rise very considerably up to six days of germinations and than begin to fall. Light does not only effect the absolute germination percentage but also the rate of germination.

Koller et al (1962) in an experiment reported that carbohydrate which are present in a form of storage material in many seeds are broken down during the early stages of germination, although somme external factors as well as inhibitors and stimulators effct carbohydrate breakdown to some extent, it seems likely that these effect are important only in so far as the breakdown products are utilized for respiration.

Materials and Methods

Variety „Kecskeméti konzerv" and „Kecskeméti törpe" was selected for the experiment. The seeds were properly placed in the petri-dishes with a equal number of one hundred, and soaked in Ion free water. Equal amount of water was added to each petri-

dish. Maintenance of temperature was equal in both cases of dark and light chambers at 22 and 28 degree centrigrade respectively. For light germination 12 hours light period was given in our light chambers (1965).

Proper care was taken by adding 1 ml. ion free water every day in case of light germinations, against drying up of seeds till the last date of germinations.

The seeds were said to be germinated when the radicle was emerged. The number of germinated seeds were counted and different parts were separated every day with utmost care untill the last and constant germination occured. Fresh weight was measured, then it was dried in oven untill the constant weight were achieved at 70° centrgrade. Dry weight was measured and carbohydrates were analysed (1956).

Results and discussions

In the dark „Kecskeméti törpe" shows quicker germination than „Kecskeméti konzerv" and intensity of germination was also more, (Fig. 1). Under light, intensity of germination is almost same up to seventh date, but in the eight day it is found to be lower, may be due to excess amount of exposure to light effect the germinations of last day (1965) but the absolute germination percentage was found to be same. (1963)

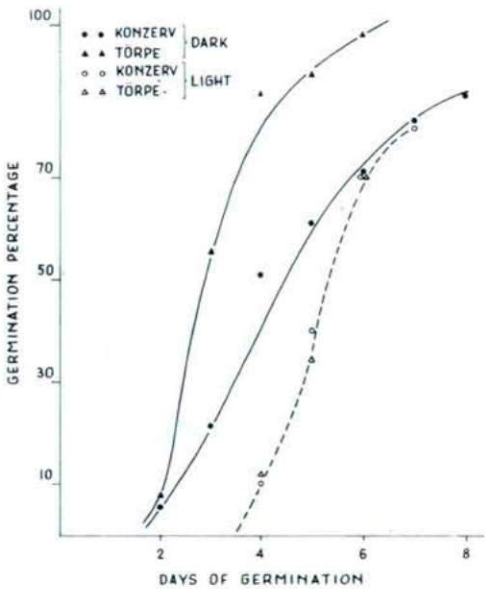

Figure 1. Germination percentage of tomato seeds under dark and light condition in different days.

From the Fig. 2—a, it can be noted that in dark there is practically no difference in dry weight between the radicle of this two variety. Both varieties show a rapid increase in dry weight. In light, variety „Törpe" shows more intensive increase in dry weight. For both varieties dry weight increase was more in light germinations.

In case of plumule (Fig. 2—b) the same phenomenon have been observed like in radicle in dark germinations, and in light there is no difference of dry weight increase between these two varieties. Dry weight was lower for both varieties germinated under light than germinated under dark. For both varieties germinated under dark and light there is no difference in dry weight decrease in cotyledon respectively (Fig. 2—c). After fifth day of germinations for both varieties decrease of dry weight was smaller in light germination than in dark.

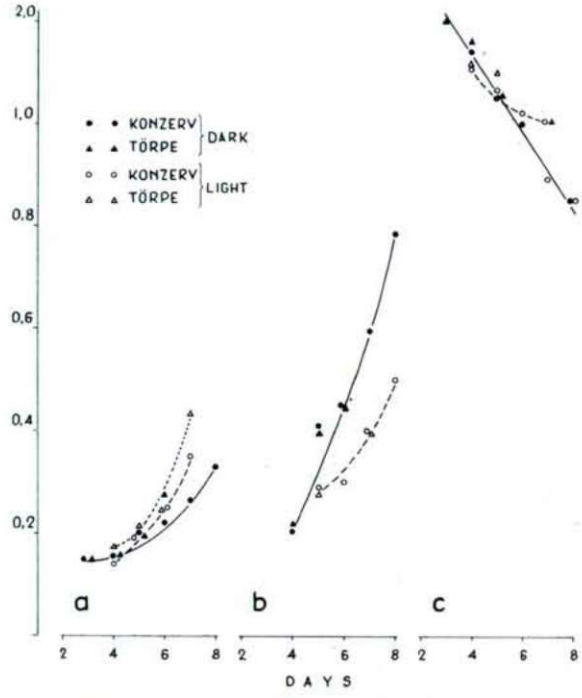

Figure 2. Dry weight changes of (a) Radicle, (b) Plumule, (c) Cotyledons of tomato seedlings grown under dark and light conditions.

In darkness (Fig. 3) variety „Törpe" shows more dry weight loss in comparision with variety „Konzerv". In light also variety „Törpe" shows dry weight loss, on the contray variety „Konzerv" shows constant gain of dry weight. The dry weight loss of variety „Törpe" in light and dark are almost same.

In dark and also in light (Fig. 4—a) the amount of carbohydrate increased in radicle is found and there are no difference between the two varieties. Light stimulates the carbohydrates accumulation of radicle in both varieties, but there are no difference in the plumule (Fig. 4—b) of both varieties neither in dark nor in light.

Both varieties has similiar trends of carbohydrate decreased in cotyledon (Fig. 4—c) and no difference was observed in dark and also in light. In light

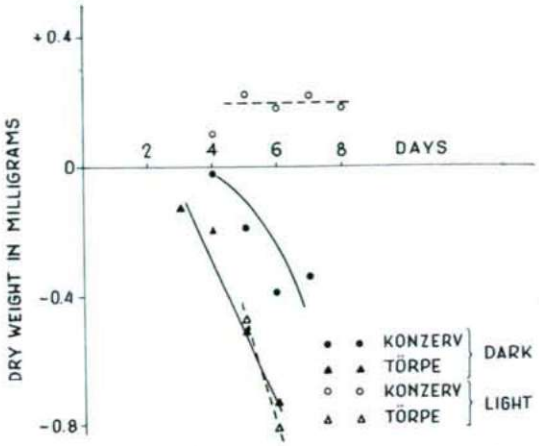

Figure 3. Dry weight loss and gain of tomato seedlings grown under dark and light.

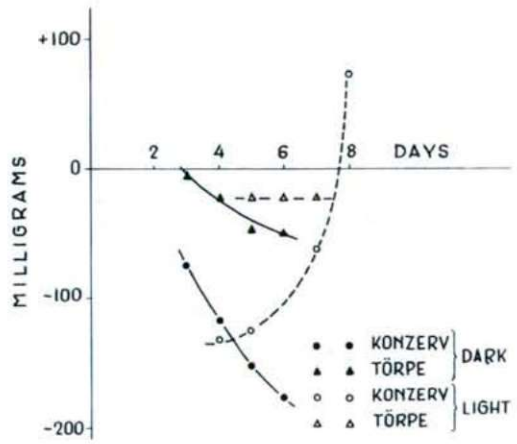

Figure 4. Carbohydrate changes of (a) Radicle, (b) Plumule, (c) cotyledon of tomato seedling in different days after germination under dark and lihgt.

after the fifth day, the carbohydrate decrease was lower than in darkness. Carbohydrate loss (Fig. 5) in variety „Konzerv" was higher both in dark and light except the eight day. After the fifth day the carbohydrate loss was similiar in light germinations than in dark.

It was observed that light enhance the dry weight increase in radicle, in higher degree in variety „Törpe" and also light inhibits the dry weight increase in plumule. The latter may be connected to the well known inhibition of light on elongation. After fifth day in light germination, the cotyledon dry weight deceases were smaller than the dark, which may be due to, besides respiration, photosynthesis also began and also the translocation to the plumule was decreased.

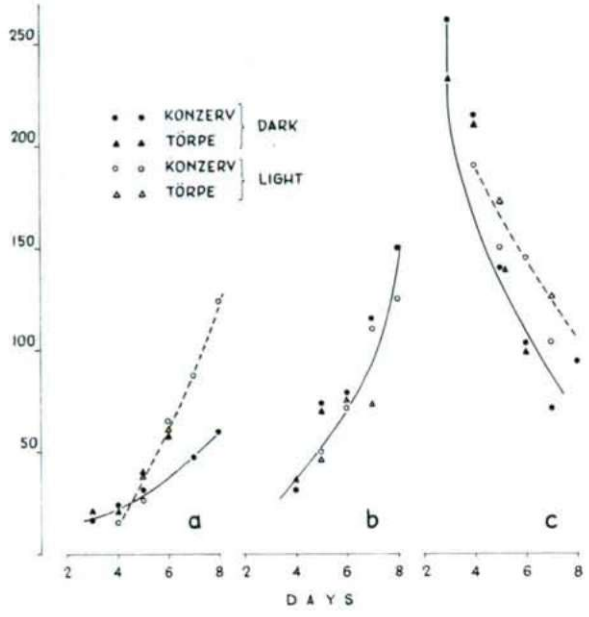

Figure 5. Carbohydrate loss and gain of tomato seedlings grown under dark and light condition.

The higher dryweight loss in „Törpe" in dark may be in connection with the more intensive germination and also may be due to intensive respiration, as the only source of energy of the process.

In light enhanced dry weight in the radicle of variety „Törpe" results no gain in dry weight while the variety „Konzerv" has constant gain of dry weight though the radicle weight was smaller. The variety „Törpe" which have probably more intensive respiration in light does not balance with the photosynthesis.

The carbohydrate changes in the radicle, plumule and in cotyledon are in accordance with the dry weight changes. In light, carbohydrate accumulation in new organs was stimulated by the beginning of photosynthesis while the carbohydrate translocation decrease in cotyledon was lower.

Variety „Törpe" which shows higher dry weight loss has a lower carbohydrate loss on the course of germinations, may be due to the respiration, of other than carbohydrates by this variety.

It is interersting to note that on eight day of germinations variety „Konzerv" shows carbohydrate increased, notwithstanding that there was dry weight increase of this variety beginning from the fifth day, which may be for the newly synthesized intermediary carbohydrate compounds were converted to nitrogen (protein) cell constituents.

Summary

The variety „Kecskeméti törpe" shows quicker germination in both in dark and light, as well as it has higher intensity of germination than the variety „Konzerv". Regarding dry weight there are practically no difference of dry weight for both varieties in dark. Variety „Törpe" shows more intensive increase in dry weight where both the varieties has an increasing tendency. Both varieties has shown similiar trends of carbohydrates decreas in cotyledon. The carbohydrate changes in the radicle, plumule and in cotyledon were in accordance with the dry weight changes.

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