# MONITORING BEHAVIOR OF DIFFERENT TOMATO GENOTYPES CULTIVATED IN ECOLOGICAL SYSTEM IN PROTECTED AREA

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**Abstract**

An increasing demand for organic vegetables is a great opportunity and a challenge for organic vegetable growers and also for researchers to develop new studies. Our challenge to develop research in ecological system has dual valence: (1) ecological systems has the potential to support biodiversity conservation through (increased number and variety of cultivated wild species, maintaining soil healthy and soil fauna, reducing the risk of water pollution) (2) use of the products obtained in organic farming is able to ensure safety food. The study was conducted on a diverse tomatoes collection cultivated in protected area in ecological culture system. We select different local populations known for high level of quality and also for resistance to pathogen attach. Our purpose is to provide healthy food for consumers and also to select the best forms for introduction in breeding programs. This research paper presents some results regarding type of growth, production potential (t/ha), precocity, plant resistance to pathogens, some fruit characteristics like: shape, color, weigh, lodge number, firmness, storage and split resistance.

**Key words**: Biodiversity, biological culture system.

In recent years people began to pay increasing attention to environment, demonstrating a growing concern for sustainable solutions to reduce the negative effects of pressure on the environment. In the same time consumers are interested in healthy products (internal and external qualities). In the last decades, quality concerns have become increasingly important worldwide and, therefore, many investigations have addressed the impact of plant nutrition on the quality of tomato fruit. Within cultivated tomato, genetic variation is very low; thus, there has long been an interest in searching for genes in exotic and primitive germplasm and closely related species. New breeding strategies now permit an in depth study and effective exploitation of the genetic diversity of wild relatives and landraces. (Passam H.C., et al. 2007). Use of local varieties perfectly adapted to environmental conditions can help to improve ecosystem health by reducing the need for pesticides and fertilizers and their effect on improving soil structure (Zhu S.D., et al., 2000, Gliessman S.R., 1998, Glass E.H., and Thurston H.D.,1978; Vandermeer J., 1995; Pimentel D., et al., 1997). Knowledge of agro-morphological and physiological characteristics of the parents in case of tomato species is a prerequisite for breeding in order to obtain performance F1 hybrid. At Vegetable Research and Development Station Bacau, Romania, after a careful study of the main features were promoted from field base (collection), which holds over 80 cultivation, the sample area 30 genitors, with unlimited growth (SP +). Promoting the genitors form the field collection in field work was based on genetic stability of the main features traced in breeding. At all promoted to field work genitors were performed biometric measurements and observations, using the evaluation criteria UPOV standards.

## MATERIAL AND METHOD

In this paper we present 12 valuable genotypes in terms of vigurozity, potential production (t/ha), precocity, plant resistance to pathogens, some qualitative fruit characteristics, etc. Selection method has been followed by positive selection of individual line and mass selection. As a calculation method it was used sequence variations, considering the values of s%:

- s < 10 - appropriated less variable,
- s between 10 and 20 - middle variability,
- s > 20 - high level of variability.

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Biological material consists of 12 lines that have met the features that we have stabilized. The local population named PL1 was used as control in our research.

There were performed biometric measurements and observations, using the evaluation criteria UPOV standards in case of all promoted field genitors. The main characteristics investigated for all genitors (SP) were: plant height (cm); the number of shoots per plant; the number of leaves (below the first inflorescence and per plant); type and structure of inflorescence; presence of pedicle, pedicle length; average weight of fruit; the total weight of fruit per plant; fruit firmness, crack and storage resistance; number of seeds in fruit; predominant shape of the fruit; fruit length, fruit diameter; external color of immature and mature fruit; the aspect of fruit surface; number of seminal lodges; skin and flesh color of fruit.

## RESULTS AND DISCUSSIONS

Agro-morphological characterization of 12 tomato genotypes cultivated in protected area, in ecological culture system is presented in tables 1-3.

Table 1

**The main characteristics of the tomato plant genitors SP+**

| No. | Type of inflores-cence | Structure of inflores-cence | Pedicle | Length of pedicle |
|---|---|---|---|---|
| PL1 | bifurcate | compact | present | long |
| L2 | bifurcate | compact | present | long |
| L19 | linear | lax | present | short |
| L4 | bifurcate | lax | present | long |
| L5 | bifurcate | lax | present | long |
| L6 | bifurcate | compact | present | long |
| L7 | bifurcate | compact | present | long |
| L8 | bifurcate | compact | present | long |
| PL9 | bifurcate | scattered | present | short |
| L10 | bifurcate | lax | present | short |
| L11 | bifurcate | lax | present | short |
| L12 | bifurcate | scattered | present | short |

Synthesis of all phenological observations and biometrical measurements permitted us a concise characterization of studied material. Eleven from twelve lines presents bifurcate type of inflorescence. The structure of inflorescence was lax in five cases, compact at five and scattered in two cases at PL9 and L12. The pedicle was present and long.

The total number of shoots per plant varies from 6 at L6 to 18 at PL1, L2, L7, L10 and L11. The number of leaves below the first inflorescence was 5 at L4, L6, L8 and 8 at L10. We registered a large variation in case of total number of leaves per plant form 22 at L4, L5 to 28 at L2 and L12. Plant height varies in small limits form 180 cm at L2, L5 and L6, to 200 cm. (*Fig. 1*)

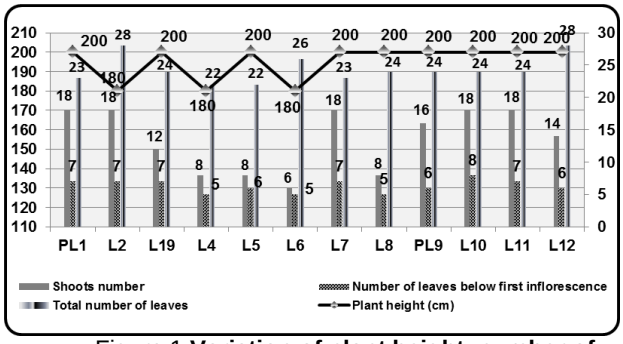


Figure 1 **Variation of plant height, number of leaves (below the first inflorescence and per plant), and number of shoots**

The shape of fruits was round, easy flattened and flattened. All lines presented at maturity fruits colored in red only L19 was dark red. The highest content of lycopene was in fruits of L19 (the fruit flesh color was dark red).

The fruit height and fruit diameter registered a small variation between 4 and 6.5 cm at fruit height and from 4 cm to 7.5 cm in case of fruit diameter.

Table 2

**The main characteristics of the tomato fruit genitors SP+**

| No. | Predominant shape of fruit | External color of | | Fruit surface | Skin color | Flesh color |
|---|---|---|---|---|---|---|
| | | immature fruit | mature fruit | | | |
| PL1 | easy flattened | light with lid | red | least ribbed | red | red |
| L2 | easy flattened | light with lid | red | least ribbed | red | red |
| L19 | flattened | light without lid | dark red | least ribbed | red | dark red |
| L4 | easy flattened | light without lid | red | ribbed | red | red |
| L5 | round | light without lid | red | netted | red | red |
| L6 | easy flattened | green without lid | red | netted | red | red |
| L7 | easy flattened | light without lid | red | least ribbed | red | red |
| L8 | easy flattened | light without lid | red | netted | red | red |
| PL9 | round | light without lid | red | netted | red | red |
| L10 | round | light with lid | red | netted | red | red |
| L11 | round | light with lid | red | netted | red | red |
| L12 | round | light with lid | red | netted | red | red |

The number of seminal loges varies from 3 at L2 to 5 at L1, L5, L6 and L11, (*Fig. 2*).

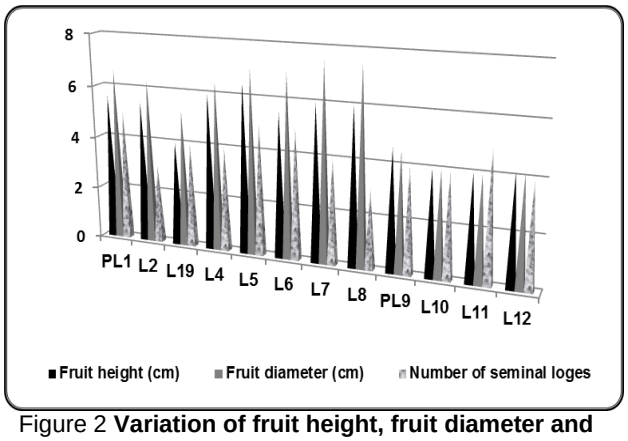


Figure 2 **Variation of fruit height, fruit diameter and number of seminal loges**

L10 noted by the largest amount of fruit harvested from a plant, 4.4 kg and also by a highest number of fruits per plant, 40 (*Fig. 3*). L6 registered the lowest yield of fruits per plant. The heaviest fruits were the fruits of L6, 220 g. For successful production of tomatoes, yield and fruit size (measured as weight) must be considered (Wessel-Beaver, L. and Scott, J.W., 1992).

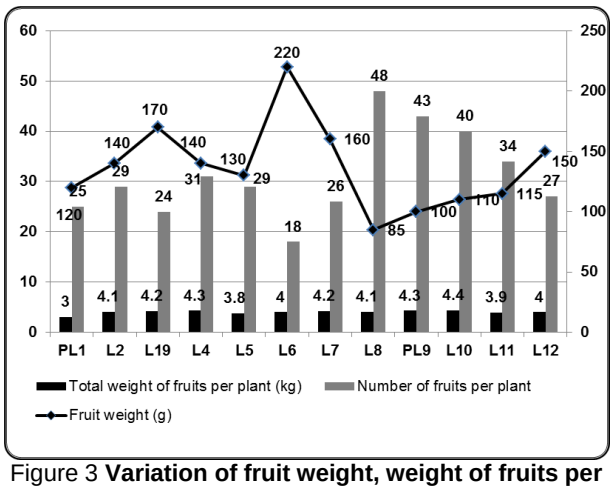


Figure 3 **Variation of fruit weight, weight of fruits per plant and number of fruits per plant**

Table 3

**Fruits firmness, crack and storage resistance of the tomato fruit**

| No. | Fruits firmness | Crack resistance | Storage resistance |
|---|---|---|---|
| PL1 | good | very good | good |
| L2 | good | very good | very good |
| L19 | very good | good | very good |
| L4 | good | good | good |
| L5 | very good | very good | very good |
| L6 | very good | very good | very good |
| L7 | very good | very good | very good |
| L8 | very good | very good | very good |
| PL9 | medium | good | medium |
| L10 | very good | very good | very good |
| L11 | low | medium | medium |
| L12 | very good | very good | very good |

Genotypes L5, L6, L7, L8, L10 and L12, were distinguished by firmness of fruits and resistance to crack and storage (*Tab. 3*). L11 presented a low level of fruit firmness and medium resistance to crack and storage.

Regarding the number of seeds in fruit the variation was between 365 seeds per fruit at L6 and 290 seeds per fruit at PL1.

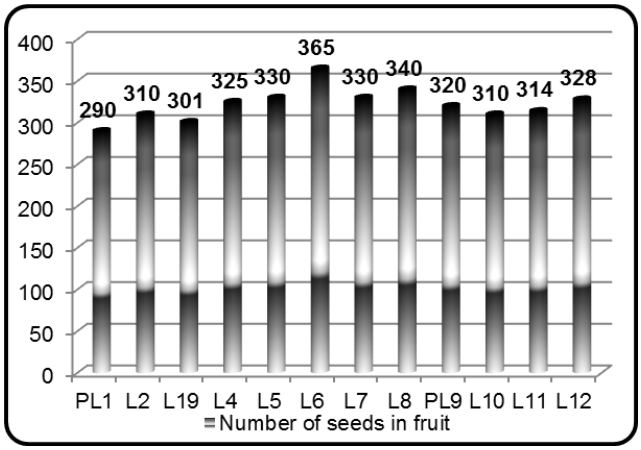


Figure 4 **Number of seeds in fruit**

In case of resistance to pest and disease nine lines presents very good resistance and three lines were resistant to pest attack and disease (*Tab 4*).

All lines obtained a proper yield, quantitative superior to control variant, PL1, as follows: 122 t/ha at L4 and121 t/ha at PL9. The best yield 125 t/ha was registered at L10 (41 t/ha more than control variant). The control variant registered the lowest level of yield, 84 t/ha (*Fig 5*).

Although the obtained yield is in accordance with the primary objective of tomato growers, to maximize the harvest of fruit per cultivation area, consumers put a great pressure on growers to improve both tomato yield and quality. (Žnidarčič D., et al, 2003).

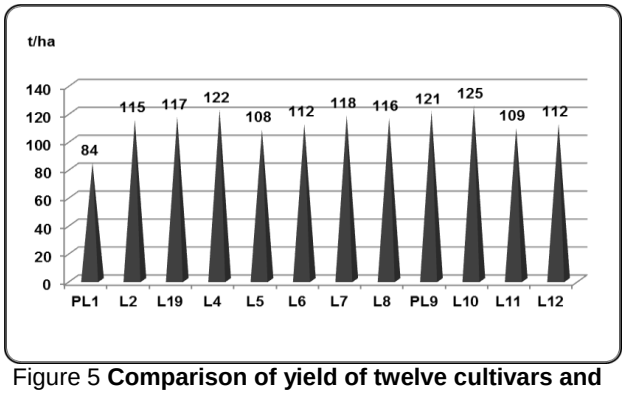


Figure 5 **Comparison of yield of twelve cultivars and control variant**

Table 4

**Synthesis of results regarding yield**

| Variant | Yield | | Difference on (control) | Resistance to | |
|---|---|---|---|---|---|
| | % | t/ha | | Disease | Pest |
| PL1 | 100.0 | 84 | | very good | very good |
| L2 | 136.9 | 115 | +31 | very good | very good |
| L19 | 139.2 | 117 | +33 | very good | very good |
| L4 | 145.2 | 122 | +38 | very good | very good |
| L5 | 128.5 | 108 | +24 | good | good |
| L6 | 133.3 | 112 | +28 | good | good |
| L7 | 140.4 | 118 | +34 | very good | very good |
| L8 | 138.0 | 116 | +32 | very good | very good |
| PL9 | 144.0 | 121 | +37 | very good | very good |
| L10 | 148.8 | 125 | +41 | very good | very good |
| L11 | 129.7 | 109 | +25 | good | good |
| L12 | 133.3 | 112 | +28 | very good | very good |

## CONCLUSIONS

Combinative ability of the parents is one of the most important attributes that determine the value of created new cultivars.

Compared with the control variant PL1, all eleven advanced homozygous lines achieved total yield over 100 t / ha in organic culture system.

Nine lines have a very good resistance to attack of pests and pathogens, which entitles us to conclude that they are suitable for organic culture.

Six lines presented very good firmness, crack and storage resistance, meaning the genotypes are recommended for storage.

## ACKNOWLEGMENTS

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