

**YIELD PERFORMANCE OF JAPANESE LOQUAT
(*Eriobotrya japonica* Lindl.) HYBRID GENOTYPES UNDER
UZBEKISTAN CONDITIONS**

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Abstract: *This study provides a scientific analysis of the yield potential of loquat (*Eriobotrya japonica* Lindl.) hybrid offspring derived from open pollination under the water-scarce and sharply continental climatic conditions of Uzbekistan. The research was conducted between 2016 and 2019 at the National Genebank of the Research Institute of Plant Genetic Resources (RIPGR) using trees aged 11–14 years. Ten promising hybrid genotypes, isolated through individual selection, were comparatively evaluated for productivity against a control standard (K-35235). Analysis of variance revealed significant genetic variation in yield among the hybrid generations. Specifically, hybrid genotype №1/11 exhibited consistently high productivity over the four-year period (175.7 c/ha), demonstrating a statistically significant 38% superiority over the standard (difference of +48.6 c/ha, $LSD_{0.05}=2.7$ c/ha). These findings scientifically substantiate the potential for loquat breeding via seed propagation to develop high-yielding, climate-resilient cultivars. Selected genotype №1/11 is recommended as a vital primary source for regional subtropical horticulture and breeding programs.*

Keywords: *Japanese loquat, Eriobotrya japonica, open pollination, hybrid genotypes, yield, individual selection, genebank, genetic resources, Uzbekistan.*

INTRODUCTION

The Japanese loquat (*Eriobotrya japonica* Lindl.) is a globally significant subtropical fruit crop, with extensive research conducted on its biological properties, yield, and breeding potential. China and Japan are recognized as the primary centers of origin, where loquat breeding is highly advanced. Scientific literature indicates that yield is directly influenced by genotype, tree age, pollination type, and agro-ecological conditions. The 10–15 year age period is considered the most stable phase for productivity in loquat, during which phenotypic differences between genotypes are most pronounced.

Extensive studies have highlighted the formation of high genetic diversity in seed generations derived from open pollination. Such generations may exhibit heterosis effects, leading to improved agronomic traits such as yield and stability. Variations in yield among loquat seedlings from open pollination can range as high as 2–3 times. Investigations under specific climatic conditions have shown that annual fluctuations in loquat yield are linked to the physiological state of the tree and environmental factors.

From the perspective of genetic resource conservation, national and international genebank collections serve as the primary reservoir for loquat breeding. In the context of climate change, international organizations emphasize the strategic importance of genetic resources for creating resilient cultivars. In Uzbekistan, loquat genetic resources are maintained at the RIPGR National Genebank for breeding and scientific research. However,

comprehensive studies on the yield of hybrid generations derived from open pollination under local conditions remain insufficient. Therefore, this research aims to fill a critical scientific gap in regional loquat breeding.

MATERIALS AND METHODS

The research was conducted from 2016 to 2019 at the RIPGR National Genebank. The experimental object consisted of offspring grown from seeds of open-pollinated standard genotype № K-35235. Ten hybrid genotypes were isolated through individual selection based on economically valuable traits. Trees were planted in a 4×5 m scheme. During the study, trees were 11–14 years old and received uniform agrotechnical care. Yield was recorded annually and calculated in c/ha. Data were processed using analysis of variance (ANOVA), and the reliability of differences was evaluated at the LSD05 level.

RESULTS AND DISCUSSION

Evaluation of the standard genotype and its hybrid offspring from 2016 to 2019 revealed broad genetic differentiation in yield among the hybrids (Table 1).

Table 1. Yield performance of Japanese loquat hybrid genotypes (2016–2019)

Genotype	2016 (11 yr)	2017 (12 yr)	2018 (13 yr)	2019 (14 yr)	Mean ± SD (c/ha)
K-35235 (Std.)	123.0	132.2	128.9	124.3	127.1 ± 4.27
1/1	102.5	114.2	109.1	107.4	108.3 ± 4.82
1/11	163.0	178.8	182.1	178.8	175.7 ± 8.56
2/14	67.4	79.7	75.9	73.0	74.0 ± 5.18

2/23	79.9	91.2	88.2	86.5	86.4 ± 4.82
3/7	92.7	105.0	101.1	98.0	99.2 ± 5.19
3/26	82.6	95.8	90.9	87.1	89.1 ± 5.61
4/29	90.2	102.5	99.8	96.4	97.2 ± 5.34
4/34	107.5	121.9	115.1	113.7	114.6 ± 5.95
4/50	72.4	86.4	81.5	78.1	79.6 ± 5.89
5/24	99.3	110.3	107.2	101.7	104.6 ± 5.02
Sx%	0,9	1,1	0,9	0,9	-
HCP05	2,6	2,9	2,6	2,5	-
HCP05 %	2,7	2,7	2,5	2,4	-

Note: LSD0.05=2.5–2.9 c/ha; CV (Sx%) = 0.9–1.1%.

Standard genotype № K-35235 yielded an average of 127.1 ± 4.27 c/ha, displaying stable dynamics across the years. Among the hybrids, genotype №1/11 achieved the highest yield (175.7 ± 8.56 c/ha), a superiority of over 38% compared to the standard. This superiority is statistically significant and is attributed to the heterosis effect or successful genetic recombination resulting from open pollination (Table 2).

Table 2. Mean yield and relative performance of loquat hybrids

Genotype	Mean yield (c/ha)	Difference vs Std. (c/ha)	% of Standard
K-35235 (Std.)	127.1	—	100
1/11	175.7	+48.6	138
4/34	114.6	–12.5	90
1/1	108.3	–18.8	85
5/24	104.6	–22.5	82

3/7	99.2	-27.9	78
4/29	97.2	-29.9	76
3/26	89.1	-38.0	70
2/23	86.4	-40.7	68
4/50	79.6	-47.5	63
2/14	74.0	-53.1	58

The yield variance from 74.0 c/ha to 175.7 c/ha illustrates intense trait segregation in loquat seed offspring, offering a broad selection scope for breeders. Conversely, low yields in certain hybrids indicate the formation of unfavorable genetic combinations during open pollination. Analysis by age showed yield peaking during the 12–13 year stage, with some genotypes showing a slight decline at 14 years due to physiological loading. National studies on non-traditional fruit breeding in Uzbekistan further confirm the practical significance of these results.

CONCLUSIONS

1. **Genotypic Comparison:** Genotype № K-35235 (Std.) was validated as a reliable standard for loquat breeding due to its stable yields and high adaptability under the sharply continental climate of Uzbekistan.
2. **Genetic Variation:** Broad genetic diversity and significant breeding potential regarding yield performance were identified in offspring derived from open pollination. The yield variation ranging from 74.0 c/ha to 175.7 c/ha (Table 1) enhances the scope for effective individual selection in the breeding process.
3. **Promising Selection:** Hybrid genotype №1/11 demonstrated superior performance with a yield of 175.7 c/ha, achieving a statistically significant 38% increase over the control. This superiority provides evidence



of a positive heterosis effect and a successful combination of economically valuable traits resulting from open pollination.

4. **Age Dynamics:** Research findings indicate that peak productivity in Japanese loquat occurs during the 12–13-year age phase of the trees. By 14 years, a slight decline in productivity was observed in certain genotypes, attributed to physiological loading.

5. **Scientific Significance:** The loquat collection maintained at the RIPGR National Genebank was confirmed as a strategically vital scientific resource for the development of non-traditional subtropical horticulture and for supporting national and international breeding initiatives.

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