

## INTISARI

Kentang (*Solanum tuberosum* L.) memiliki potensi besar dalam perbaikan genetik, namun pengembangannya masih menghadapi keterbatasan akibat perbanyakan vegetatif umbi klonal yang kurang efisien dan minim variabilitas genetik. *True potato seed* (TPS) merupakan propagul biji generatif hasil reproduksi seksual, sebagai dasar penghasil variabilitas genetik yang luas dan potensi perbaikan genetik kentang. Penelitian ini bertujuan mengidentifikasi kombinasi tetua tetraploid non-inbred terbaik dalam menghasilkan TPS dengan kualitas mutu dan kuantitas benih tinggi, dan evaluasi awal F1 Progeni dengan sifat agronomis unggul dan umur genjah. Penelitian menggunakan desain persilangan *full diallel* antara empat tetua non-inbred, dengan evaluasi progeni F1 menggunakan rancangan acak lengkap dan *mixed model* untuk memperoleh estimasi *Best Linear Unbiased Estimates* (BLUEs). Evaluasi mutu benih TPS dilakukan berdasar standar ISTA, evaluasi F1 dihitung menggunakan parameter agronomis BLUEs, nilai heritabilitas ( $H^2$ ), kemajuan genetik (GA), dan index seleksi MGIDI. Validasi molekuler menggunakan marker umur genjah SCARA2-02, SCARA4-21, dan SCARA5-16. Hasil menunjukkan kombinasi persilangan LPD × MZD (LM) menghasilkan rerata (215 biji/beri) dengan viabilitas 94,74%, serta tetua LPD × GRL (LG) menghasilkan (173 biji/beri) dengan viabilitas 91,33%. Nilai *Reproductive Efficiency Index* (REI) tertinggi diperoleh pada LM (1939,91) dan LG (1475,18) menghasilkan parameter kualitas dan kuantitas TPS terbaik. Progeni F1 LG 35 (90 hst) dengan kemampuan produktivitas (216,67 gr/tanaman) (*Early Mature Type*), LG 29 (95 hst) produktivitas (437,68 gr/tanaman), Progeni umur 100 hst diantaranya MS 13 produktivitas (661,95 g/tanaman), LG 27 (431,59 g/tanaman), LG 126 (428,25 g/tanaman) sebagai klonal terseleksi kentang umur genjah (*Medium Mature Type*). Integrasi data fenotipik dan molekuler menunjukkan kesesuaian antara pola amplifikasi penanda SCARA dengan ekspresi fenotip umur genjah. Penelitian ini memberikan kerangka praktis untuk seleksi generasi klonal awal dalam program pemuliaan kentang berbasis TPS berdaya hasil tinggi dan berumur genjah.

Kata kunci: Kentang (*Solanum tuberosum*), Persilangan Non-Inbred, F1 Progeni, Seleksi Klonal, Seleksi MGIDI, TPS (True Potato Seed), Penanda molekuler, Umur genjah

## ABSTRACT

Potato (*Solanum tuberosum* L.) has great potential for genetic improvement; however, its development still faces limitations due to clonal tuber-based vegetative propagation, which is inefficient and provides limited genetic variability. *True potato seed* (TPS) is a generative propagule derived from sexual reproduction, serving as a basis for generating broad genetic variability and enhancing potato genetic improvement. This study aimed to identify the best combinations of non-inbred tetraploid parents in producing TPS with high seed quality and quantity, and to conduct an initial evaluation of F1 progenies with superior agronomic traits and early maturity. The study employed a full diallel crossing design among four non-inbred parents, with F1 progeny evaluation using a completely randomized design and a mixed model to obtain Best Linear Unbiased Estimates (BLUEs). TPS seed quality evaluation was conducted based on ISTA standards. F1 evaluation was performed using agronomic parameters based on BLUEs, heritability ( $H^2$ ), genetic advance (GA), and the MGIDI selection index. Molecular validation was carried out using early maturity markers SCARA2-02, SCARA4-21, and SCARA5-16. The results showed that the cross combination LPD × MZD (LM) produced a mean of 215 seeds per berry with a viability of 94.74%, while the cross LPD × GRL (LG) produced 173 seeds per berry with a viability of 91.33%. The highest Reproductive Efficiency Index (REI) values were obtained in LM (1939.91) and LG (1475.18), indicating the best TPS quality and quantity parameters. F1 progeny LG 35 (90 days after planting) exhibited a productivity of 216.67 g per plant (Early Mature Type), while LG 29 (95 days after planting) showed a productivity of 437.68 g per plant. Progenies at 100 days after planting included MS 13 with a productivity of 661.95 g per plant, LG 27 with 431.59 g per plant, and LG 126 with 428.25 g per plant, identified as selected early-maturing potato clones (Medium Mature Type). The integration of phenotypic and molecular data showed consistency between SCARA marker amplification patterns and the phenotypic expression of early maturity. This study provides a practical framework for early clonal generation selection in TPS-based potato breeding programs with high yield potential and early maturity.

**Keywords:** Potato (*Solanum tuberosum*), Non-Inbred Crossbreeding, F1 Progenies, Clonal selection, MGIDI Selection, TPS (True Potato Seed), Molecular markers, Early Maturity