

Potassium Fertilization for Improving Yield and Quality of Red Delicious Apple in Kashmir Valley, India

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Introduction

Apple plays an important role in the economy of India's Jammu and Kashmir state, which produces 1.966 million metric tons on an area of 162,000 ha. Although the agro-climatic conditions of the state are congenial for apple production, productivity and fruit quality is low; non-adoption of appropriate fertilization technology, particularly potassium (K), is one of the main reasons. Potassium is known as the quality nutrient, and has a greater influence on growth and yield of apples than any other nutrient element. However, crop requirements of K varies greatly depending on the nature of the crop, rootstock, stage of growth, environmental factors and soil management practices. Field trials were conducted during 2015 and 2016 to determine the most efficient dose of K to improve the yield and quality of the most commonly grown variety, Red Delicious.

Methods

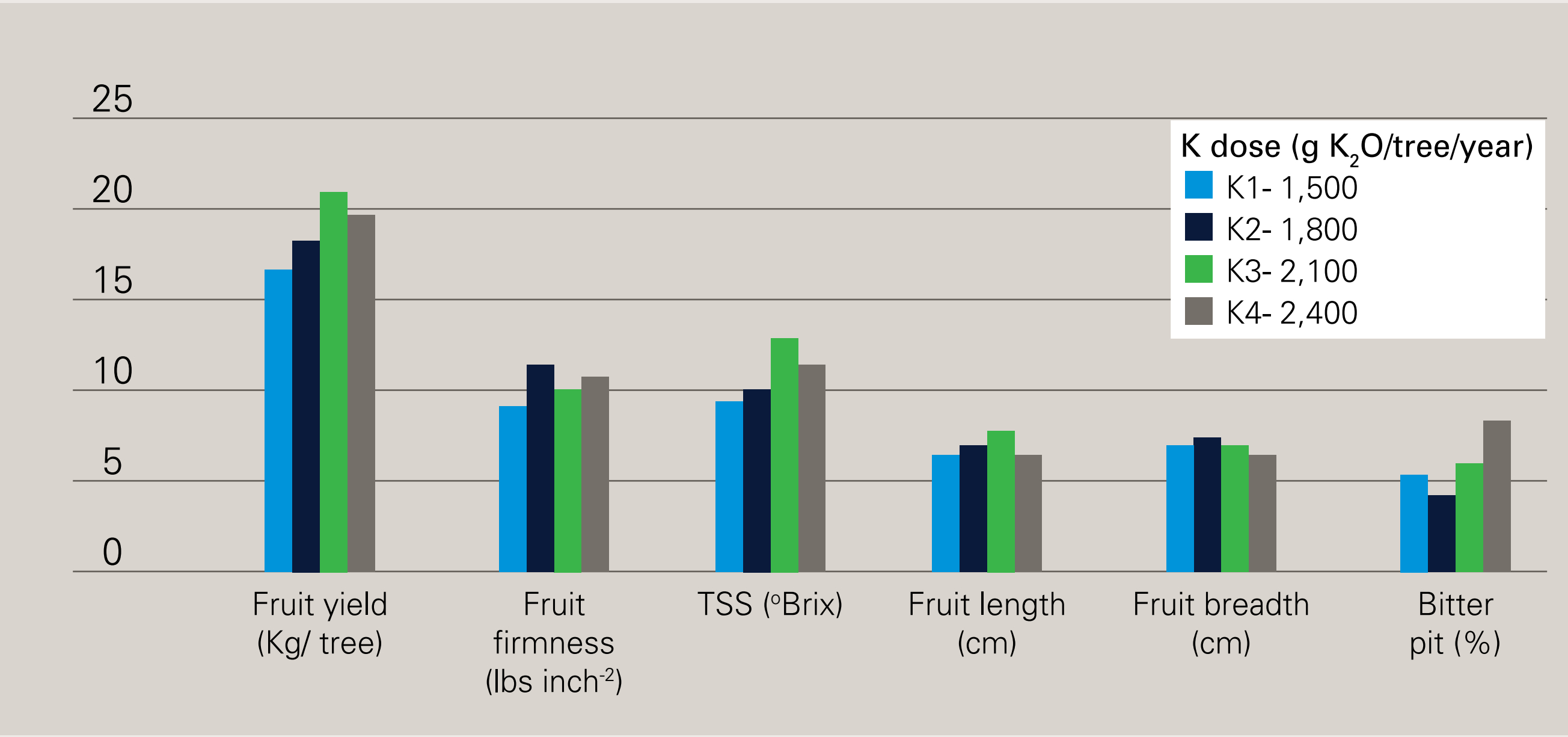
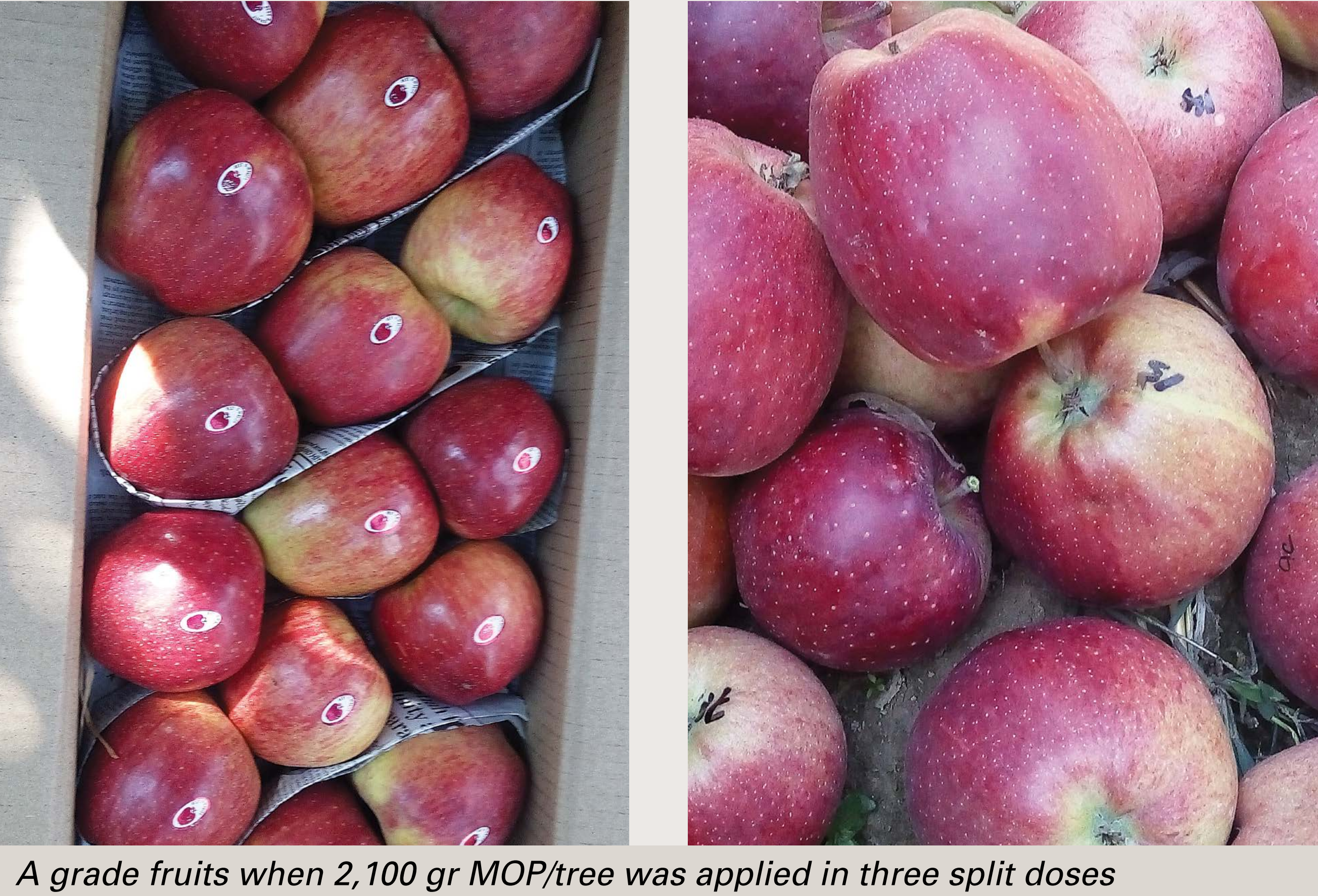
Field trials were conducted during 2015 and 2016 on farmers' fields in the three districts of Baramulla, Ganderbal and Srinagar. The trials were laid out in a random block design with six replications and three trees as plot size. Twenty-year-old Red Delicious trees with uniform vigour were selected and four treatment combinations, consisting of different levels of K through muriate of potash (MOP), were applied:

- 1,500 g K₂O/plant/year (K1), recommended by the University
- 1,800 g K₂O/plant/year (K2)
- 2,100 g K₂O/plant/year (K3)
- 2,400 g K₂O/plant/year (K4)

Three different application timings were also tested:

- Two doses – 21 days before expected bloom and one month after bloom, recommended by the University (D1)
- Three doses – 21 days before expected bloom, one month after bloom and one month after the second dose (D2)
- Four doses – 21 days before expected bloom, one month after bloom, one month after the second dose and one month after the third dose (D3)

Nitrogen (N) and phosphorus (P) were applied as per the recommendations. Various yield and quality parameters of apple were recorded after the harvest of the fruits.



Results and discussion

- The highest fruit yield of 208.29 kg/tree and total soluble salt content of 13.530 Brix was recorded from treatment K3 and timing D3. This compared to treatment K1 and timing D1, which yielded 162.79 kg/tree.
- Fruit firmness ranged from 8.90 to 11.73 lbs/inch, with the highest resulting from K2 and D3.
- Fruit length increased from 6.66 (K1, D1) to 8 cm (K3, D3).
- Fruit breadth varied from 6.82-7.51 cm, being highest with treatment K2 and timing D3.
- The bitter pit incidence was lowest (4.11%) with treatment K2 and timing D3, and increased whether K application was higher or lower than this.
- A significant increase in leaf and fruit K content was noticed when the K dose was increased (from K1 to K4).
- The highest (2.59%) leaf calcium (Ca) content was also recorded with treatment K2 and timing D3, compared to 2.31% with K4 and D3, and 2% with K1 and D3.
- After 30 days of ambient storage the physiological loss in weight (PLW) of fruits was minimum (5.37%) with treatment K2 and timing D2, followed by 5.40% (D1) and 5.43% (D3).



Table 1. Apple yield and other fruit characteristics as influenced by K application on farmers' fields (mean of three districts and over two years, 2015 and 2016)

K dose (g K ₂ O/tree/year)	Fruit yield (kg/ tree)	Fruit firmness (lbs/inch)	TSS (°Brix)	Fruit length (cm)	Fruit breadth (cm)	Bitter pit (%)
K ₁ 1,500	165.25	09.25	09.53	6.78	6.86	5.38
K ₂ 1,800	179.07	11.56	10.16	7.06	7.42	4.18
K ₃ 2,100	205.85	09.87	12.92	7.86	7.28	5.89
K ₄ 2,400	195.03	10.70	11.39	6.81	6.66	8.55
CD (0.05 %)	003.66	00.37	0.19	0.21	0.09	0.52

Conclusions

The results showed that 1,800-2,100 g K₂O/tree applied in three or four split doses resulted in the highest yields and quality of apple fruits.

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IPI is a non-governmental and non-profit organization based in Zug, Switzerland. Founded in 1952 by German and French potash producers, it is now supported by potash producers in Europe and the Near East. IPI is governed by a Technical Secretariat and Board which convene several times each year. A major part of IPI's work is carried out by its team of field agronomists, or coordinators, who work closely with researchers, government offices, extension and agribusinesses around the world. IPI's mission is to develop and promote balanced fertilization for higher yields and more nutritious food, ensuring sustainable production through the conservation of soil fertility for future generations.

