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# Standardize suitable pre-treatment for drying of mango peel into powder

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## Abstract
The present investigation was carried out on effect of pre-treatments on quality of mango peel powder. the investigation was laid out using completely randomized design with factorial concept for retention of physico-chemical and sensory quality using sixteen treatment combinations of potassium meta-bisulphite (0ppm, 500ppm, 1000ppm and 1500ppm) and ascorbic acid (0ppm, 100ppm, 200ppm and 300ppm). After pre-treatments, the samples of peel were blanched at 85±5ºC for 5 minutes, then drained and dried at 60ºC till final moisture content of 8%. Mango peel powder which was dehydrated by giving pre-treatment to peel with the combination of 1000 ppm KMS and 200 ppm ascorbic acid ($A_3K_3$) found superior based on drying kinetics, nutritional as well as sensory quality and thus pusses great potential for utilization of processing waste.

**Keywords:** Mango peel, Ascorbic acid, potassium meta-bisulphite, physico-chemical and sensory quality

## Introduction
Mango (*Mangifera indica* L.) is one of the most important fruits crop belonging to family Anacardiaceae and is known as king of fruit. Mango is the main fruit of Asia and has developed its own importance all over the world. India is the largest producer and exporter of mango in the world. In India, mango processing industry is the largest industry utilizing about 20% of mangoes into different processed products (Ravani and Joshi, 2013) [13]. Due to such a huge mango processing share, the mango processing industry generates a large quantity of waste in the form of peel and kernel (Puligundla *et al*., 2014) [12]. The fruit of mango comprised of about 20 to 30 per cent of peel (Larrauri *et al*., 1996) [9] which is good source of fibre, pectin and antioxidant. Mango peel contains dietary fibre (DF) in the range of 40.6 to 72.5% (Ajila, 2013) [1] and lipid in the range of 0.75 to 1.70 per cent (Bose and Mitra, 2001) [4]. Valencia (2007) [15] reported that dietary fibre plays an important role in the prevention and treatment of obesity, atherosclerosis, coronary heart diseases, colorectal cancer and diabetes. These dietary fibres (polysaccharide or oligosaccharide) are known to possess resistant to enzymatic digestion and includes cellulose, hemicelluloses, pectin, gums, mucilage and a non-carbohydrate component called 'lignin'. The diets rich in fibre have a positive effect on health and their consumption has been known since times to decrease incidence of several diseases. American Association of Cereal Chemists (AACC) and Australia New Zealand Food Authority (ANZFA) defined dietary fibre as the fraction of edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. According to this definition, the term dietary fiber includes polysaccharides, oligosaccharides and lignins. The panel on the definition of dietary fibre constituted by National Academy of Science during the year 2002, defined the dietary fibre complex to include dietary fibre, function fibre and total fibre. According to National Academy of Science, the term dietary fiber consist of non-digestible carbohydrates and lignin that are intrinsic and intact in plants, while the term 'functional fibre' consist of isolated, non-digestible carbohydrates which have beneficial physiological effects in humans and the term 'total fibre' is the sum of dietary fibre and functional fibre (Dhingra, 2012) [5]. Thus owing to such nutritional value of peel, it becomes utmost important to standardize suitable pre-treatment for drying of mango peel into powder for utilization in preparation of value added products. Mango peel is being utilized for preparation of peel powder, for extraction of mangiferen, anti-oxidant, different cosmetic products and fibre extraction this fibre can be utilized for preparation of pre-biotic nectar and fibre inreached bakery product such as Biscuits are the most popularly consumed bakery items in the world

due to their ready to eat nature, affordable cost, good nutritional quality, availability in different tastes and longer shelf life (Hassan *et al.*, 2011) [6]. Thus, in the present investigation mango peel was preserve by drying.

## Material method

The present investigation was conducted in the Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari-396450, Gujarat (India) during 2014-16. Mature fruits of mango were procured form Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari and brought to Department of Post-Harvest Technology, ASPEE College of Horticulture and Forestry, NAU, Navsari, Gujarat. Mango fruits were ripened in ripening chamber using 100 ppm of ethylene gas.

The mango peel was collected in plastic crate. Collected mango peel was washed three times with tap water to remove the adhering pulp. After washing, peel was cut into small pieces (2cm width x 8cm length) and then pre-treated with 16 different treatment combinations (Table 1) of potassium meta-bisuphite (KMS) [Control ($K_1$), 500 ppm ($K_2$), 1000 ppm ($K_3$) and 1500 ppm ($K_4$)] (Factor 1) and ascorbic acid [Control ($A_1$), 100 ppm ($A_2$), 200 ppm ($A_3$) and 300 ppm ($A_4$)] (Factor 2) concentrations. Pre-treatment combination of Control i.e. $K_1$ and $A_1$ was without KMS / ascorbic acid pre-treatment and expressed as "0" ppm in the detailed treatment combinations (Table 1). After pre-treatments, the samples of peel were blanched at 85±5ºC for 5 minutes, then drained and dried at 60ºC till final moisture content of 8%. The dried peel was milled to fine powder in grinder followed by packing in polypropylene bag of 200 gauge thickness (capacity 100g).

**Factor 1:** KMS pre-treatments (K)

| KMS levels (K) | Concentration (ppm) |
|---|---|
| $K_1$ | Control (00) |
| $K_2$ | 500 |
| $K_3$ | 1000 |
| $K_4$ | 1500 |

**Factor 2:** Ascorbic Acid pre-treatments (A)

| Ascorbic Acid levels (A) | Concentration (ppm) |
|---|---|
| $A_1$ | Control (00) |
| $A_2$ | 100 |
| $A_3$ | 200 |
| $A_4$ | 300 |

**Table 1:** Details of treatment combinations used for standardization of pre-treatments for drying mango peel into powder.

| Treatment combinations | KMS (K), ppm | Ascorbic acid (A), ppm |
|---|---|---|
| $T_1$:$K_1A_1$ | 0 | 0 |
| $T_2$:$K_1A_2$ | 0 | 100 |
| $T_3$:$K_1A_3$ | 0 | 200 |
| $T_4$:$K_1A_4$ | 0 | 300 |
| $T_5$:$K_2A_1$ | 500 | 0 |
| $T_6$:$K_2A_2$ | 500 | 100 |
| $T_7$:$K_2A_3$ | 500 | 200 |
| $T_8$:$K_2A_4$ | 500 | 300 |
| $T_9$:$K_3A_1$ | 1000 | 0 |
| $T_{10}$:$K_3A_2$ | 1000 | 100 |
| $T_{11}$:$K_3A_3$ | 1000 | 200 |
| $T_{12}$:$K_3A_4$ | 1000 | 300 |
| $T_{13}$:$K_4A_1$ | 1500 | 0 |
| $T_{14}$:$K_4A_2$ | 1500 | 100 |
| $T_{15}$:$K_4A_3$ | 1500 | 200 |
| $T_{16}$:$K_4A_4$ | 1500 | 300 |

## Results and discussion

### Proximate compositions of fresh mango fruit and mango peel.

### Mango fruits

The physico-chemical characteristics of mango fruits used for the preparation of value products are given in Table 2. The data pertaining to physical parameters of fresh mango fruits revealed fruit weight, fruit volume, fruit length, fruit width, fruit diameter, pulp weight, peel weight, stone weight, pulp/ peel ratio, pulp/stone ratio and stone/kernel ratio in the average range of 264.6±20.32gm, 265.2±8.35cc, 10.24±4.15cm, 5.95±3.37cm, 20.34±1.25cm, 156.53±12.87gm, 50.15±2.24gm, 57.92±3.45gm, 3.12:1, 2.70:1 and 1:1.5, respectively. Further, data on chemical parameters of mango fruits given in Table 2 depicted moisture content, TSS, total sugars, reducing sugars, non-reducing sugars, acidity, ascorbic acid, carbohydrates, fibre, ash, carotenoids, proteins, pectin and total phenols in the average range of 76.75±0.25%, 19.85±0.16ºBrix, 15.46±0.65%, 4.24±0.58%, 10.66±0.39%, 0.34±0.25%, 9.780.87mg/100g, 24.13±0.38%, 0.10±0.45%, 465±0.41µg/g, 0.70±0.74%, 0.40±0.35% and 243.19±0.61mg GAE/g, respectively. The data on mineral composition of mango fruits depicted potassium, calcium and sodium in the average range of 189.24±0.62ppm, 10.12±0.45ppm, and 70.13±0.24ppm respectively. Our results in present investigation for physico-chemical parameters of mango fruits were closely related with the observations made by Bose and Mitra (2001) [4], Hussain *et al.* (2003) [7], Ajela *et al.* (2008) [2], Mingire (2010) [10], Vahora (2010) [14], Yadav (2011) [16] and Puligundla *et al.* (2014) [12].

### Mango peel

The physico-chemical characteristics of mango peel used for the preparation of value added products are given in Table 2. The data pertaining to physico-chemical parameters of mango peel revealed moisture content, TSS, total sugars, reducing sugars, non-reducing sugars, carbohydrate, fibre, fat, ash, carotenoids, proteins, pectin and total phenols in the average range of 75.25±0.37%, 14.21±0.38ºBrix, 10.11±0.85%, 3.56±0.41%, 6.55±0.49%, 20.16±0.36%, 7.41±0.76%, 0.66±0.28%, 1.30±0.31%, 517±0.37µg/g, 1.76±0.0.26%, 7.15±0.87% and 125.35±0.83mg GAE/g, respectively. The data on mineral composition of mango peel depicted potassium, calcium, and sodium in the average range of 132.56±0.32ppm, 41.48±0.21ppm and 54.19±0.37ppm respectively. Our results in present investigation for physico-chemical parameters of fresh mango peel were closely related with the observations made by Hussain *et al.* (2003) [7], Ajela *et al.* (2008) [2], Ravani and Joshi (2013) [13] and Puligundla *et al.* (2014) [12].

**Table 2:** Proximate composition of fresh mango fruits and mango peel.

| Parameters | Fruits | Peel |
|---|---|---|
| Fruit weight (g) | 264.6±20.32 | - |
| Fruit volume (cc) | 265.2±8.35 | - |
| Fruit length (cm) | 10.42±4.15 | - |
| Fruit width (cm) | 5.95±3.37 | - |
| Fruit diameter (cm) | 20.34±1.25 | - |
| Pulp weight (g) | 156.53±12.87 | - |
| Peel weight (g) | - | 50.15±2.24 |
| Pulp/ peel ratio | - | 3.12:1 |
| Moisture (%) | 76.75±0.23 | 75.25±0.37 |
| TSS (°Brix) | 19.85±0.16 | 14.21±0.38 |
| Total sugars (%) | 15.46±0.65 | 10.11±0.85 |
| Reducing sugars (%) | 4.24±0.58 | 3.56±0.41 |
| Non-reducing sugars (%) | 10.66±0.39 | 6.55±0.49 |
| Acidity (%) | 0.34±0.25 | - |
| Ascorbic Acid (mg/100g) | 9.78±0.87 | - |
| Carbohydrates (%) | 24.13±0.38 | 20.16±0.36 |
| Fibre (%) | 0.10±0.43 | 7.41±0.76 |
| Fats (%) | - | 0.66±0.28 |
| Ash (%) | 0.40±0.36 | 1.3±0.31 |
| Carotenoids (μg/g) | 465±0.41 | 517±0.37 |
| Proteins (%) | 0.70±0.74 | 1.76±0.26 |
| Pectin (%) | 0.40±0.35 | 7.15±0.87 |
| Total phenols (mg GAE/g) | 243.19±0.64 | 125.35±0.83 |
| K (ppm) | 189.24±0.62 | 132.56±0.32 |
| Ca (ppm) | 10.12±0.45 | 41.48±0.21 |
| Na (ppm) | 70.13±0.24 | 54.19±0.37 |

**Physico-chemical Characteristics of mango peel**

**Dehydration kinetics of mango peel.**

**Recovery percentage**

the among different potassium metabisulphite (KMS) pre-treatments, the mean recovery of mango peel powder (K) varied significantly between 10.39% and 11.01%, with maximum recovery of peel powder from peel which was dehydrated by giving pre-treatment with 1500 KMS ($K_4$). Among different ascorbic acid pre-treatment, the mean recovery (A) varied significantly between 10.41% and 11.15%, with maximum recovery of peel powder from peel samples which were dehydrated by giving pre-treatment dip with 300 ppm ascorbic acid ($A_4$). Ashuqullah (2017) [3] recorded maximum powder recovery when sweet potato slices were pre-treated with 2000 ppm KMS as compared to control. Data on interactions KMS and ascorbic acid (KxA) depicted maximum recovery of peel powder in peel dehydrated by giving pre-treatment with the combination of 1500 ppm potassium metabisulphite and 300 ppm ascorbic acid ($K_4A_4$). However, interactions of KMS and ascorbic acid pre-treatments (KxA) were found to have non-significant effect on recovery.

**Dehydration ratio**

The mean dehydration ratio of mango peel (K) varied significantly between 9.39 and 9.64, with minimum dehydration ratio in peel which was dehydrated by pre-treatment with 1500 ppm KMS ($K_4$). Minimum dehydration of the powder depicted higher yield of the powder after dehydration. Thus minimum dehydration ratio is desirable attribute to select the treatment. Among different ascorbic acid pre-treatment, the mean dehydration varied significantly between 9.12 and 9.73, minimum dehydration ratio in peel dehydrated without ascorbic acid pre-treatment ($A_1$). Ashuqullah (2017) [3] recorded minimum dehydration ratio when sweet potato slices were pre-treated with 2000 ppm KMS as compared to control. Data on interactions of KMS and ascorbic acid pre-treatment (KxA) depicted minimum dehydration ratio in peel which was dehydrated by giving pre-treatment with the combination of 1500 ppm KMS and 300 ppm ascorbic acid ($K_4A_4$). However, the interactions of KMS and ascorbic acid pre-treatments (KxA) were found to have significant effect on dehydration ratio.

**Dehydration rate**

The dehydration rate of mango peel has been presented in Table 3. Data shows that among different KMS pre-treatments, the mean dehydration rate of mango peel (K) varied significantly between 6.26 g/min and 6.62 g/min, with maximum dehydration rate in peel which was dehydrated by pre-treatment with 1500 ppm KMS ($K_4$). Maximum dehydration rate of peel depicted less dehydration time for powder preparation and assumed to be of good quality attributes. Among different ascorbic acid pre-treatments, the mean dehydration rate of mango peel (A) varied significantly between 6.22 g/min and 6.67 g/min, with maximum dehydration rate in peel which was dehydrated by giving pre-treatment dip with 300 ppm of ascorbic acid ($A_4$). Ashuqullah (2017) [3] recorded maximum dehydration rate when sweet potato slices were pre-treated with 2000 ppm KMS as compared to control. Nagela *et al.* (2014) [11] reported higher dehydration rate in peel which was blanched and dried at higher temperature of 80ºC. Data on interactions of KMS and ascorbic acid pre-treatment (KxA) depicted maximum dehydration rate in peel dehydrated by giving pre-treatment with the combination of 1500 ppm KMS and 300 ppm ascorbic acid ($K_4A_4$). However, the interactions of KMS and ascorbic acid pre-treatments (KxA) were found to have non-significant effect on dehydration rate.

**Dehydration time**

the dehydration time of mango peel (K) varied significantly between 15.57 hours and 15.92 hours, with minimum dehydration time in peel which was dehydrated by giving pre-treatment with 1500 ppm KMS ($K_4$) and maximum in peel dehydrated by without KMS pre-treatment ($K_1$). Among different ascorbic acid pre-treatment, the mean dehydration time (A) varied significantly between 14.50 hours and 16.57 hours, with minimum dehydration time in peel which was dehydrated by giving pre-treatment with 300 ppm ascorbic acid ($A_4$) Kakali *et al*. (2014) [8] observed drying upto 10% moisture content in 12 hours when peel was washed with tap water and dried at 55ºC. Ashuqullah (2017) [3] recorded minimum dehydration time in sweet potato slices which were pre-treated with 2000 ppm KMS as compared to control. Data on interactions of KMS and ascorbic acid pre-treatment (KxA) depicted minimum dehydration time in peel dehydrated by giving pre-treatment with the combination of 1500 ppm KMS and 300 ppm ascorbic acid ($K_4A_4$). However, the interactions of KMS and ascorbic acid pre-treatments (KxA) were found to have non-significant effect on dehydration time.

**Quality characteristics of mango peel powder**

Perusal of data pertaining to effect of different pre-treatments on moisture content of mango peel powder has been presented in Table 4. The interactions of KMS and ascorbic acid pre-treatment (KxA) were found to have non-significant effect on moisture content, carbohydrate percentage and fibre percentage. reported similar findings with significant effect in moisture content of dehydrated onion rings, cauliflower segments and okra slices which were given pre-treatment with the combination of KMS and citric acid before dehydration. The similar reason for other processed products had been reported by for dehydrated onion rings, Kakali *et al.* (2014) [8] for mango peel and kernel powder biscuits, Puligundla *et al.* (2014) [12] for dried mango peel, for mango peel and kernel based biscuits and Ajela *et al.* (2008) [2] for dietary powder of mango peel. reported lower moisture absorption in dehydrated onion rings which were pre-treated with 2500 ppm KMS. It may be due to variation absorption of moisture by hydroscopic sugars formed as a result of hydrolysis of polysaccharides. The similar results for this had been reported by for dehydrated onion rings, Kakali *et al.* (2014) [8] for mango peel and kernel powder biscuits, Puligundla *et al.* (2014) [12] for mango peel, for mango peel and kernel based biscuits, Ajela *et al.* (2008) [2] for dietary powder of mango peel. While carotenoids content, phenols content and sensory colour score of mango peel powder were significantly resulted. Carotenoids µg/g and phenols contains has retains by pre-treatment with KMS and citric acid after blanching at 85 °C for 5 minutes. Similar results were also reported by reported better retention of carotenoids due to sulphitation in dried apricot. reported decrease in total phenol content of orange peel powder. Similar results were also documented by for decrease in total phenols content during storage of orange juices. Sensory colour score of mango peel powder also significantly affected by potassium metabiosulphte and ascorbic acid pre-treatments this might be due to the reason that ascorbic acid act as potent anti-oxidant and KMS which helps to reduce the colour degradation.

**Conclusion**

Overall, it can be concluded that mango peel powder dehydrated by different pre-treatment combinations of potassium meta-bisulphite and ascorbic acid has maximum nutritional and sensory quality with maximum drying kinetics. The moisture content, carbohydrate and fibre content had non-significant effect whereas, carotenoids content phenols content and sensory colour value has significant effect by pre-treatments of KMS and ascorbic acid after blanching. Mango peel powder with better quality attributes can be dehydrated by giving pre-treatment to peel with the combination of 1000 ppm KMS and 200 ppm ascorbic acid ($A_3K_3$).

**Table 3:** Effect of pre-treatments on recovery, dehydration ratio, dehydration rate and dehydration time of mango peel powder (10kg tray load).

| Parameters | KMS pre-treatments (K) | Ascorbic acid pre-treatments (A) | | | | Mean (K) |
|---|---|---|---|---|---|---|
| | | Control ($A_1$) | 100ppm ($A_2$) | 200ppm ($A_3$) | 300ppm ($A_4$) | |
| Powder recovery (%) | Control ($K_1$) | 9.84 | 10.10 | 10.56 | 11.07 | 10.39 |
| | 500ppm ($K_2$) | 10.44 | 10.48 | 10.67 | 11.15 | 10.64 |
| | 1000ppm ($K_3$) | 10.51 | 10.53 | 10.71 | 11.18 | 10.73 |
| | 1500ppm ($K_4$) | 10.86 | 10.87 | 11.10 | 11.21 | 11.01 |
| | Mean (A) | 10.41 | 10.45 | 10.76 | 11.15 | 10.69 |
| | | S. Em.± | C.D. @ 5 % | | CV | |
| | K | 0.099 | 0.282 | | 3.21 | |
| | A | 0.099 | 0.282 | | | |
| | KxA | 0.198 | NS | | | |
| Dehydration ratio | Control ($K_1$) | 10.16 | 9.90 | 9.18 | 9.03 | 9.57 |
| | 500ppm ($K_2$) | 9.58 | 9.72 | 9.37 | 8.97 | 9.41 |
| | 1000ppm ($K_3$) | 9.51 | 9.50 | 9.34 | 8.94 | 9.32 |
| | 1500ppm ($K_4$) | 9.21 | 9.20 | 9.01 | 8.92 | 9.08 |
| | Mean (A) | 9.62 | 9.58 | 9.22 | 8.97 | 9.35 |
| | | S. Em.± | C.D. @ 5 % | | CV | |
| | K | 0.118 | 0.337 | | 4.38 | |
| | A | 0.118 | 0.337 | | | |
| | KxA | 0.237 | NS | | | |
| Drying rate (g/min) | Control ($K_1$) | 5.53 | 6.40 | 6.57 | 6.56 | 6.26 |
| | 500ppm ($K_2$) | 6.41 | 6.53 | 6.64 | 6.59 | 6.54 |
| | 1000ppm ($K_3$) | 6.41 | 6.49 | 6.70 | 6.77 | 6.59 |
| | 1500ppm ($K_4$) | 6.52 | 6.55 | 6.66 | 6.75 | 6.62 |
| | Mean (A) | 6.22 | 6.49 | 6.64 | 6.67 | 6.50 |
| | | S. Em.± | C.D. @ 5 % | | CV | |
| | K | 0.116 | 0.329 | | 2.56 | |
| | A | 0.116 | 0.329 | | | |
| | KxA | 0.231 | NS | | | |
| Drying time (hours) | Control ($K_1$) | 17.25 | 15.96 | 15.63 | 14.85 | 15.92 |
| | 500ppm ($K_2$) | 16.45 | 15.87 | 15.51 | 14.54 | 15.59 |
| | 1000ppm ($K_3$) | 16.30 | 16.25 | 15.35 | 14.36 | 15.57 |
| | 1500ppm ($K_4$) | 16.28 | 16.38 | 15.00 | 14.24 | 15.48 |
| | Mean (A) | 16.57 | 16.12 | 15.37 | 14.50 | 15.64 |
| | | S. Em.± | C.D. @ 5 % | | CV | |
| | K | 0.080 | 0.227 | | 4.25 | |
| | A | 0.080 | 0.227 | | | |
| | KxA | 0.160 | NS | | | |

**Table 3:** Effect of pre-treatments on moisture, carbohydrates, fibre, phenols and colour of mango peel powder.

| Treatment combination | Parameters | | | | | |
|---|---|---|---|---|---|---|
| | **Moisture (%)** | **Carbohydrates (%)** | **Fibre (%)** | **Carotenoids (µg/g)** | **Phenols** | **Colour** |
| $K_1A_1$ | 8.29 | 75.71 | 31.39 | 2756 | 18.08 | 6.97 |
| $K_1A_2$ | 8.21 | 76.20 | 31.73 | 2794 | 18.43 | 7.21 |
| $K_1A_3$ | 8.19 | 76.35 | 31.88 | 2834 | 18.75 | 7.42 |
| $K_1A_4$ | 8.19 | 76.37 | 31.85 | 2867 | 19.89 | 7.40 |
| $K_2A_1$ | 8.24 | 75.85 | 31.68 | 2811 | 20.76 | 7.75 |
| $K_2A_2$ | 8.15 | 76.46 | 31.87 | 2856 | 21.38 | 7.70 |
| $K_2A_3$ | 8.09 | 76.51 | 32.06 | 2857 | 23.46 | 7.68 |
| $K_2A_4$ | 8.15 | 76.54 | 31.95 | 2863 | 22.28 | 7.62 |
| $K_3A_1$ | 8.21 | 75.86 | 32.21 | 2866 | 24.67 | 8.15 |
| $K_3A_2$ | 8.13 | 76.47 | 31.95 | 2873 | 24.12 | 8.20 |
| $K_3A_3$ | 8.08 | 76.54 | 32.01 | 2876 | 22.87 | 8.50 |
| $K_3A_4$ | 8.11 | 76.66 | 31.92 | 2881 | 22.42 | 8.30 |
| $K_4A_1$ | 8.20 | 75.85 | 32.20 | 2846 | 25.03 | 7.89 |
| $K_4A_2$ | 8.12 | 76.47 | 31.93 | 2865 | 24.62 | 8.22 |
| $K_4A_3$ | 8.08 | 76.53 | 32.00 | 2872 | 24.38 | 8.52 |
| $K_4A_4$ | 8.09 | 76.65 | 31.92 | 2875 | 24.02 | 8.47 |
| Mean | 8.16 | 76.31 | 31.91 | 2849 | 22.20 | 7.88 |
| S. Em.± | 0.17 | 1.05 | 0.52 | 51.53 | 0.53 | 0.15 |
| CV (%) | 3.67 | 2.39 | 2.81 | 3.13 | 4.12 | 3.37 |

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