

# SOYBEAN PERFORMANCE—2019

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## Introduction

Soybean is a potentially valuable new crop for the Pacific Northwest (PNW). Soybean can provide raw materials for biodiesel, high-quality protein, and oil for human consumption, all of which are in short supply in the PNW. In addition, edible, or vegetable, soybean production can provide a raw material for specialized food products. Soybean is valuable as a rotation crop because of the soil-improvement effects of its residues and its nitrogen (N<sub>2</sub>)–fixing capability. Because high-value irrigated crops are typically grown in the Snake River Valley, soybeans may be economically feasible only at high yields. The most common rotation crop in the Treasure Valley is irrigated winter wheat, so soybeans need to be competitive in value with winter wheat.

This report summarizes work done in 2019 as part of our continuing breeding and selection program to adapt soybeans to eastern Oregon and includes the added yield enhancements achieved by changing planting configuration. Our soybean reports from the last decade are available at our station website <http://agsci.oregonstate.edu/mes/malheur-experiment-station>. A search function on the home page will conveniently find all of our recent reports dealing with soybeans by using the key word “soybean.”

## Materials and Methods

The 2019 trial was conducted on Owyhee silt loam soil previously planted to wheat. After the wheat was harvested in 2018, the stubble was shredded and the field was irrigated to sprout unharvested wheat kernels and then the field was disked. A soil analysis taken in the fall of 2018 showed that the top foot of soil had a pH of 7.8, 3.4% organic matter, 6 ppm nitrate (NO<sub>3</sub>), 2 ppm ammonium (NH<sub>4</sub>), 69 ppm phosphorus (P), 225 ppm potassium (K), 9 ppm sulfur (S), 2759 ppm calcium, 450 ppm magnesium (Mg), 58 ppm sodium, 2.4 ppm zinc (Zn), 4 ppm manganese (Mn), 1.2 ppm copper (Cu), 33 ppm iron, and 0.6 ppm boron (B). Based on the soil analysis, 125 lb K/acre, 80 lb S/acre, 2 lb Mn/acre, and 1 lb B/acre were broadcast before plowing. After the fertilizer was spread, the field was moldboard plowed, groundhogged twice, and bedded to 30-inch rows.

Fifty-five lines selected in 2009 and 2010 were evaluated. The 55 selections were planted in plots 4 rows wide by 25 ft long. The experimental design was a randomized complete block design with four replicates. The seed was planted on May 10 at 200,000 seeds/acre in three rows on each 30-inch bed using a plot drill with disc openers. The rows were spaced 7 inches apart. *Bradyrhizobium japonicum* inoculant (America’s Best Inoculant, Advanced Biological Marketing, Inc., Van Wert, OH) was applied to the seed before planting. Emergence started on May 20. The field was furrow irrigated to maintain the soil water tension at 8-inch depth below 60 cb.

Plant height in each plot was measured on August 8. Each plot was evaluated for lodging and seed shatter on October 15. Lodging was rated as the degree to which the plants were leaning over (0 = vertical, 10 = prostrate). The middle two beds in each four-bed plot were harvested on October 15 and 16, using a Wintersteiger Nurserymaster small-plot combine. Beans were cleaned, and weighed, and a subsample was oven dried to determine moisture content. Moisture at the time of analysis was determined by oven drying at 100°C for 24 hours. Dry bean yields were corrected to 13% moisture.

## Results and Discussion

Yields in 2019 averaged 57 bu/acre and ranged from 46 bu/acre for selection 42-8-10 to 64 bu/acre for selection 14-8-10 (Table 1). Many lines had seed counts sufficient for the manufacturing of tofu (<2,270 seeds/lb). All of the soybean materials evaluated had light-colored seed coats and pale hilums. Averaged over cultivars and years, seed yields averaged 59 bu/acre and seed size averaged 2,312 seeds/lb (Table 2).

## Summary

Reasonable soybean yields can be achieved in the Treasure Valley by employing varieties selected for the environment, high planting rates, modest fertilization, use of *Bradyrhizobium japonicum* inoculation, proper May planting dates, appropriate irrigation, and timely control of lygus bugs and spider mites.

## Acknowledgements

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Table 1. Performance of soybean selections in 2019. Malheur Experiment Station, Oregon State University, Ontario, OR. (Table 1 continues on the next page.)

| Selection | Cross   | Interm. sel. | Yield<br>bu/acre | Height<br>cm | Days to maturity<br>from emergence | Lodging<br>0-10 | Seed size<br>seeds/lb |
|-----------|---------|--------------|------------------|--------------|------------------------------------|-----------------|-----------------------|
| 8-2-10    | Korada  |              | 49.0             | 105          | 131                                | 7               | 2,321                 |
| 11-21-09  | M92-330 | M1           | 53.4             | 93           | 124                                | 3               | 2,350                 |
| 11-3-10   | M92-330 | M1           | 58.8             | 90           | 124                                | 0               | 2,058                 |
| 12-1-10   | M92-330 | M2           | 58.7             | 94           | 124                                | 1               | 2,223                 |
| 12-7-10   | M92-330 | M2           | 51.8             | 91           | 124                                | 1               | 2,154                 |
| 14-3-10   | M92-330 | M4           | 56.5             | 88           | 124                                | 0               | 2,164                 |
| 14-4-10   | M92-330 | M4           | 59.1             | 88           | 124                                | 1               | 2,187                 |
| 14-5-10   | M92-330 | M4           | 58.6             | 84           | 124                                | 0               | 2,096                 |
| 14-8-10   | M92-330 | M4           | 64.0             | 90           | 124                                | 0               | 2,144                 |
| 15-3-10   | M92-330 | M9           | 58.3             | 92           | 124                                | 1               | 2,071                 |
| 16-8-10   | M92-330 | M12          | 59.9             | 92           | 124                                | 1               | 1,908                 |
| 16-10-10  | M92-330 | M12          | 61.5             | 92           | 124                                | 1               | 2,150                 |
| 17-4-10   | M92-330 | M13          | 56.7             | 95           | 124                                | 1               | 2,217                 |
| 17-5-10   | M92-330 | M13          | 57.9             | 92           | 124                                | 1               | 2,094                 |
| 17-10-10  | M92-330 | M13          | 53.1             | 87           | 124                                | 0               | 2,121                 |
| 18-2-10   | M92-330 | M15          | 58.9             | 93           | 124                                | 1               | 2,075                 |
| 18-7-10   | M92-330 | M15          | 59.2             | 91           | 124                                | 1               | 2,067                 |
| 18-8-10   | M92-330 | M15          | 55.8             | 88           | 124                                | 0               | 2,129                 |
| 19-6-10   | M92-330 | M16          | 59.8             | 87           | 124                                | 1               | 1,984                 |
| 19-7-10   | M92-330 | M16          | 57.9             | 93           | 124                                | 0               | 2,005                 |
| 19-8-10   | M92-330 | M16          | 62.2             | 91           | 124                                | 0               | 2,152                 |
| 19-9-10   | M92-330 | M16          | 56.3             | 96           | 124                                | 1               | 2,484                 |
| 19-10-10  | M92-330 | M16          | 57.0             | 90           | 124                                | 1               | 2,263                 |
| 20-7-09   | M92-085 | 101          | 58.7             | 95           | 124                                | 3               | 2,392                 |
| 20-11-09  | M92-085 | 101          | 58.0             | 99           | 124                                | 2               | 2,272                 |
| 20-11-09  | M92-085 | 101          | 59.2             | 97           | 124                                | 1               | 2,275                 |
| 20-1-10   | M92-085 | 101          | 50.6             | 91           | 124                                | 0               | 1,952                 |

Table 1. (continued) Performance of soybean selections in 2019. Malheur Experiment Station, Oregon State University, Ontario, OR.

| Selection  | Cross   | Interm. sel. | Yield   | Height | Days to maturity | Lodging | Seed size |
|------------|---------|--------------|---------|--------|------------------|---------|-----------|
|            |         |              | bu/acre | cm     | from emergence   | 0-10    | seeds/lb  |
| 20-4-10    | M92-085 | 101          | 57.0    | 94     | 124              | 0       | 2,081     |
| 20-6-10    | M92-085 | 101          | 53.1    | 95     | 124              | 1       | 2,038     |
| 20-7-10    | M92-085 | 101          | 55.7    | 105    | 128              | 3       | 2,125     |
| 21-12-10   | M92-085 | 103          | 57.4    | 98     | 124              | 2       | 2,200     |
| 23-6-10    | M92-085 | 106          | 50.7    | 100    | 124              | 3       | 2,268     |
| 24-1-09    | M92-085 | 107          | 59.4    | 97     | 124              | 1       | 2,236     |
| 24-2-09    | M92-085 | 107          | 49.2    | 93     | 124              | 2       | 2,367     |
| 24-2-09    | M92-085 | 107          | 60.7    | 93     | 124              | 3       | 2,331     |
| 24-3-10    | M92-085 | 107          | 55.7    | 95     | 124              | 1       | 2,286     |
| 30-1-10    | M92-220 | 303          | 58.7    | 92     | 124              | 1       | 2,314     |
| 30-3-10    | M92-220 | 303          | 57.8    | 93     | 124              | 1       | 2,168     |
| 30-5-10    | M92-220 | 303          | 58.0    | 91     | 124              | 1       | 2,204     |
| 31-1-10    | M92-220 | 305          | 62.2    | 86     | 124              | 1       | 2,179     |
| 31-3-10    | M92-220 | 305          | 55.2    | 95     | 124              | 2       | 2,217     |
| 31-5-10    | M92-220 | 305          | 58.1    | 91     | 124              | 1       | 2,062     |
| 31-8-10    | M92-220 | 305          | 60.4    | 95     | 124              | 1       | 2,197     |
| 32-3-10    | M92-220 | 307          | 56.8    | 95     | 124              | 1       | 2,200     |
| 34-1-10    | M92-220 | 309          | 55.5    | 91     | 124              | 1       | 2,326     |
| 34-11-10   | M92-220 | 309          | 53.7    | 98     | 124              | 4       | 2,355     |
| 35-6-10    | M92-220 | 311          | 60.1    | 92     | 124              | 1       | 2,092     |
| 36-6-10    | M92-220 | 312          | 55.9    | 93     | 124              | 2       | 2,239     |
| 36-7-10    | M92-220 | 312          | 55.0    | 88     | 124              | 1       | 2,345     |
| 36-10-10   | M92-220 | 312          | 58.6    | 88     | 124              | 0       | 2,060     |
| 37-9-10    | M92-220 | 313          | 58.7    | 95     | 124              | 2       | 2,556     |
| 40-3-10    | M92-314 | 601          | 63.3    | 90     | 124              | 1       | 2,034     |
| 41-3-10    | M92-314 | 608          | 60.4    | 98     | 124              | 1       | 1,998     |
| 42-8-10    | OR-6    | 905          | 45.7    | 89     | 131              | 8       | 2,677     |
| 43-10-10   | OR-6    | 909          | 50.1    | 87     | 131              | 8       | 2,160     |
| Average    |         |              | 57.0    | 93     | 124              | 2       | 2,193     |
| LSD (0.05) |         |              | 7.3     | 7      |                  | 1       |           |

Table 2. Yield and seed size for soybean selections from 2014 to 2019. Malheur Experiment Station, Oregon State University, Ontario, OR. Planting dates: May 28, 2014, May 26, 2015, June 3, 2016, May 19, 2017, May 15, 2018, and May 10, 2019. (Table 2 continues on next page.)

| Selection | Yield               |      |      |      |      |      |         | Seed size            |       |       |       |       |       |         |
|-----------|---------------------|------|------|------|------|------|---------|----------------------|-------|-------|-------|-------|-------|---------|
|           | 2014                | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2014                 | 2015  | 2016  | 2017  | 2018  | 2019  | Average |
|           | ----- bu/acre ----- |      |      |      |      |      |         | ----- seeds/lb ----- |       |       |       |       |       |         |
| 8-2-10    | 63.1                | 61.0 | 53.9 | 57.1 | 58.8 | 49.0 | 57.1    | 2,364                | 2,138 | 2,570 | 2,630 | 2,259 | 2,321 | 2,380   |
| 11-21-09  | 70.3                | 73.8 | 46.8 | 61.2 | 50.8 | 53.4 | 59.4    | 2,302                | 2,245 | 2,717 | 2,815 | 2,265 | 2,350 | 2,478   |
| 11-3-10   | 64.5                | 73.4 | 56.8 | 64.8 | 68.0 | 58.8 | 64.4    | 2,322                | 1,945 | 2,719 | 2,398 | 2,121 | 2,058 | 2,282   |
| 12-1-10   | 62.2                | 64.0 | 49.9 | 58.7 | 49.7 | 58.7 | 57.2    | 2,182                | 1,964 | 2,710 | 2,452 | 2,128 | 2,223 | 2,276   |
| 12-7-10   | 71.6                | 66.2 | 41.6 | 59.2 | 55.4 | 51.8 | 57.6    | 1,991                | 1,837 | 2,629 | 2,429 | 2,064 | 2,154 | 2,184   |
| 14-3-10   | 64.2                | 68.5 | 40.5 | 64.5 | 53.0 | 56.5 | 57.2    | 2,072                | 1,936 | 2,684 | 2,343 | 2,124 | 2,164 | 2,220   |
| 14-4-10   | 71.4                | 75.6 | 45.8 | 60.8 | 55.9 | 59.1 | 61.4    | 2,104                | 1,971 | 2,680 | 2,389 | 2,045 | 2,187 | 2,229   |
| 14-5-10   | 66.5                | 70.6 | 47.0 | 63.1 | 57.2 | 58.6 | 60.5    | 2,106                | 1,943 | 2,642 | 2,326 | 2,045 | 2,096 | 2,193   |
| 14-8-10   | 71.2                | 73.3 | 51.3 | 63.0 | 56.3 | 64.0 | 63.2    | 2,091                | 1,883 | 2,711 | 2,401 | 2,141 | 2,144 | 2,228   |
| 15-3-10   | 67.6                | 73.6 | 48.0 | 64.6 | 57.7 | 58.3 | 61.6    | 2,172                | 1,952 | 2,626 | 2,389 | 2,115 | 2,071 | 2,221   |
| 16-8-10   | 72.4                | 73.2 | 53.9 | 63.4 | 59.4 | 59.9 | 63.7    | 2,154                | 1,869 | 2,700 | 2,378 | 2,030 | 1,908 | 2,173   |
| 16-10-10  | 66.8                | 70.2 | 42.5 | 59.8 | 59.2 | 61.5 | 60.0    | 2,091                | 1,917 | 2,717 | 2,430 | 2,127 | 2,150 | 2,258   |
| 17-4-10   | 70.2                | 71.6 | 51.0 | 63.3 | 57.5 | 56.7 | 61.7    | 2,121                | 1,941 | 2,693 | 2,436 | 2,132 | 2,217 | 2,257   |
| 17-5-10   | 68.4                | 69.0 | 46.8 | 61.0 | 55.4 | 57.9 | 59.8    | 2,079                | 1,919 | 2,741 | 2,451 | 1,979 | 2,094 | 2,211   |
| 17-10-10  | 62.7                | 72.5 | 45.4 | 61.1 | 57.9 | 53.1 | 58.8    | 2,199                | 1,942 | 2,686 | 2,377 | 2,009 | 2,121 | 2,222   |
| 18-2-10   | 65.3                | 71.9 | 44.2 | 61.6 | 56.6 | 58.9 | 59.7    | 2,183                | 1,942 | 2,641 | 2,462 | 2,094 | 2,075 | 2,233   |
| 18-7-10   | 67.4                | 68.7 | 46.4 | 56.5 | 56.8 | 59.2 | 59.2    | 2,014                | 1,894 | 2,828 | 2,403 | 1,966 | 2,067 | 2,195   |
| 18-8-10   | 70.2                | 64.5 | 46.8 | 61.9 | 63.7 | 55.8 | 60.5    | 2,093                | 1,911 | 2,638 | 2,340 | 1,949 | 2,129 | 2,177   |
| 19-6-10   | 67.2                | 70.8 | 42.6 | 67.1 | 59.4 | 59.8 | 60.6    | 2,045                | 1,944 | 2,627 | 2,312 | 1,954 | 1,984 | 2,144   |
| 19-7-10   | 61.4                | 69.2 | 46.6 | 66.9 | 60.6 | 57.9 | 60.0    | 2,105                | 1,953 | 2,663 | 2,461 | 2,028 | 2,005 | 2,202   |
| 19-8-10   | 75.1                | 65.5 | 44.0 | 65.8 | 57.2 | 62.2 | 61.6    | 1,998                | 1,961 | 2,595 | 2,317 | 1,967 | 2,152 | 2,165   |
| 19-9-10   | 65.1                | 67.4 | 55.8 | 65.1 | 56.6 | 56.3 | 61.1    | 2,195                | 2,055 | 2,742 | 2,624 | 2,186 | 2,484 | 2,381   |
| 19-10-10  | 63.1                | 62.7 | 54.8 | 61.9 | 59.2 | 57.0 | 59.8    | 2,087                | 1,872 | 2,624 | 2,412 | 2,058 | 2,263 | 2,219   |
| 20-7-09   | 61.8                | 66.8 | 42.0 | 58.8 | 43.8 | 58.7 | 55.3    | 2,318                | 2,225 | 2,707 | 2,876 | 2,202 | 2,392 | 2,453   |
| 20-11-09  | 68.1                | 65.0 | 44.0 | 60.0 | 49.3 | 58.0 | 57.4    | 2,368                | 2,368 | 2,725 | 2,809 | 2,217 | 2,272 | 2,460   |
| 20-11-09  | 64.6                | 67.0 | 46.0 | 59.1 | 45.3 | 59.2 | 56.9    | 2,359                | 2,187 | 2,667 | 2,901 | 2,556 | 2,275 | 2,491   |
| 20-1-10   | 60.2                | 72.2 | 45.3 | 58.6 | 52.6 | 50.6 | 56.6    | 2,169                | 1,978 | 2,589 | 2,307 | 2,062 | 1,952 | 2,176   |
| 20-4-10   | 67.2                | 70.2 | 45.3 | 61.7 | 55.6 | 57.0 | 59.5    | 2,079                | 1,941 | 2,658 | 2,392 | 1,972 | 2,081 | 2,187   |
| 20-6-10   | 67.7                | 68.3 | 48.3 | 54.2 | 58.6 | 53.1 | 58.4    | 2,116                | 1,952 | 2,603 | 2,462 | 2,152 | 2,038 | 2,229   |

Table 2. (continued) Yield and seed size for soybean selections from 2014 to 2019. Malheur Experiment Station, Oregon State University, Ontario, OR. Planting dates: May 28, 2014, May 26, 2015, June 3, 2016, May 19, 2017, May 15, 2018, and May 10, 2019.

| Selection  | Yield               |      |      |      |      |      |         | Seed size            |       |       |       |       |       |         |
|------------|---------------------|------|------|------|------|------|---------|----------------------|-------|-------|-------|-------|-------|---------|
|            | 2014                | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2014                 | 2015  | 2016  | 2017  | 2018  | 2019  | Average |
|            | ----- bu/acre ----- |      |      |      |      |      |         | ----- seeds/lb ----- |       |       |       |       |       |         |
| 20-7-10    | 60.8                | 67.1 | 44.5 | 63.2 | 50.3 | 55.7 | 56.9    | 2,062                | 1,905 | 2,665 | 2,334 | 2,001 | 2,125 | 2,182   |
| 21-12-10   | 65.6                | 68.4 | 51.3 | 58.5 | 59.4 | 57.4 | 60.1    | 2,178                | 2,014 | 2,645 | 2,528 | 2,140 | 2,200 | 2,284   |
| 23-6-10    | 57.5                | 68.7 | 51.9 | 62.6 | 61.3 | 50.7 | 58.8    | 2,098                | 1,973 | 2,587 | 2,428 | 1,988 | 2,268 | 2,224   |
| 24-1-09    | 63.7                | 60.7 | 51.8 | 63.8 | 58.8 | 59.4 | 59.7    | 2,458                | 2,443 | 2,815 | 2,896 | 2,425 | 2,236 | 2,561   |
| 24-2-09    | 59.3                | 62.7 | 54.3 | 55.6 | 48.0 | 49.2 | 54.9    | 2,350                | 2,099 | 2,734 | 2,923 | 2,245 | 2,367 | 2,453   |
| 24-2-09    | 67.0                | 57.6 | 41.5 | 58.7 | 46.9 | 60.7 | 55.4    | 2,392                | 2,139 | 2,678 | 2,943 | 2,415 | 2,331 | 2,518   |
| 24-3-10    | 68.4                | 58.9 | 50.4 | 60.3 | 58.3 | 55.7 | 58.7    | 2,131                | 1,977 | 2,688 | 2,291 | 2,058 | 2,286 | 2,239   |
| 30-1-10    | 65.5                | 62.4 | 45.3 | 62.9 | 48.2 | 58.7 | 57.2    | 2,279                | 2,269 | 2,635 | 2,880 | 2,357 | 2,314 | 2,456   |
| 30-3-10    | 66.8                | 63.7 | 48.4 | 59.1 | 53.2 | 57.8 | 58.2    | 2,296                | 2,200 | 2,666 | 2,727 | 2,266 | 2,168 | 2,387   |
| 30-5-10    | 67.8                | 65.0 | 51.9 | 61.3 | 53.0 | 58.0 | 59.5    | 2,347                | 2,259 | 2,767 | 2,717 | 2,135 | 2,204 | 2,405   |
| 31-1-10    | 65.8                | 68.2 | 48.3 | 58.5 | 47.3 | 62.2 | 58.4    | 2,294                | 2,154 | 2,587 | 2,775 | 2,349 | 2,179 | 2,389   |
| 31-3-10    | 66.3                | 63.5 | 48.7 | 59.1 | 51.4 | 55.2 | 57.3    | 2,244                | 2,181 | 2,646 | 2,773 | 2,345 | 2,217 | 2,401   |
| 31-5-10    | 65.2                | 59.6 | 49.9 | 61.8 | 47.4 | 58.1 | 57.0    | 2,362                | 2,185 | 2,658 | 2,892 | 2,287 | 2,062 | 2,408   |
| 31-8-10    | 64.3                | 58.7 | 53.1 | 66.1 | 50.6 | 60.4 | 58.9    | 2,202                | 2,148 | 2,684 | 2,712 | 2,302 | 2,197 | 2,374   |
| 32-3-10    | 69.6                | 60.9 | 50.2 | 62.5 | 51.6 | 56.8 | 58.6    | 2,355                | 2,112 | 2,682 | 2,744 | 2,262 | 2,200 | 2,392   |
| 34-1-10    | 65.9                | 58.3 | 45.0 | 57.0 | 51.2 | 55.5 | 55.5    | 2,170                | 2,062 | 2,670 | 2,766 | 2,138 | 2,326 | 2,355   |
| 34-11-10   | 57.0                | 61.2 | 45.2 | 53.0 | 47.8 | 53.7 | 53.0    | 2,302                | 2,036 | 2,745 | 2,838 | 2,139 | 2,355 | 2,402   |
| 35-6-10    | 62.6                | 65.1 | 48.8 | 69.6 | 52.1 | 60.1 | 59.7    | 2,445                | 2,127 | 2,647 | 2,875 | 2,184 | 2,092 | 2,395   |
| 36-6-10    | 55.7                | 62.9 | 37.0 | 59.4 | 50.0 | 55.9 | 53.5    | 2,383                | 2,118 | 2,739 | 2,911 | 2,435 | 2,239 | 2,471   |
| 36-7-10    | 58.5                | 59.9 | 48.6 | 62.6 | 52.9 | 55.0 | 56.2    | 2,310                | 2,171 | 2,729 | 2,826 | 2,225 | 2,345 | 2,434   |
| 36-10-10   | 67.5                | 66.7 | 53.7 | 61.6 | 58.8 | 58.6 | 61.2    | 2,065                | 1,907 | 2,637 | 2,356 | 2,055 | 2,060 | 2,180   |
| 37-9-10    | 69.5                | 68.1 | 49.9 | 61.3 | 64.9 | 58.7 | 62.1    | 2,097                | 1,995 | 2,735 | 2,528 | 2,722 | 2,556 | 2,396   |
| 40-3-10    | 67.6                | 60.7 | 47.7 | 65.0 | 59.5 | 63.3 | 60.6    | 2,163                | 1,947 | 2,812 | 2,460 | 1,978 | 2,034 | 2,232   |
| 41-3-10    | 66.7                | 56.2 | 53.7 | 65.6 | 60.1 | 60.4 | 60.4    | 2,134                | 1,916 | 2,614 | 2,329 | 1,973 | 1,998 | 2,161   |
| 42-8-10    | 29.9                | 53.4 | 52.4 | 48.2 | 48.0 | 45.7 | 46.3    | 2,848                | 2,241 | 2,688 | 2,783 | 2,541 | 2,677 | 2,630   |
| 43-10-10   | 52.3                | 53.4 | 56.2 | 43.9 | 44.7 | 50.1 | 50.1    | 2,121                | 1,944 | 2,457 | 2,885 | 2,254 | 2,160 | 2,304   |
| Average    | 64.8                | 65.8 | 48.2 | 60.8 | 54.6 | 57.0 | 58.5    | 2,210                | 2,038 | 2,675 | 2,579 | 2,167 | 2,193 | 2,312   |
| LSD (0.05) | 8.9                 | 4.7  | 8.7  | 8.4  | 8.6  | 7.3  | 3.4     | 149                  | 90    | NS    | 172   | 206   | NS    | 66      |