# JUPITER – A NEW *OROBANCHE* RESISTANT SUNFLOWER HYBRID

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**ABSTRACT**

**The sunflower hybrid Jupiter, registered in 2005, was obtained by crossing two inbreds bred by self-pollination and recurrent selection. The maternal form is male sterile form and the male fertile paternal pollen fertility restorer is branched allowing a good pollination.**
**The new hybrid belongs to semi-late group and is superior to checks in yielding ability, oil yield stability, genetic resistance to *Orobanche cumana.* The lines have good coincidence at flowering, so that high yields of hybrid seed can be obtained. It is recommended in all sunflower growing areas, especially in those infested with *Orobanche cumana.***

**Key words**: *Orobanche* resistance, oil content, recurrent selection, semi-late hybrid, sunflower

## INTRODUCTION

The diversification of sunflower hybrid sets is a constant concern of breeding programs, with a view to increase the yield level, stability and quality. Hybrids from crossing inbred lines, which have been the approaches of modern sunflower breeding, allow the highest plant efficiency, through the best expression of heterosis for seed yield and oil content (Vrânceanu, 1969, 2000). Obtaining highest yields, approaching the biological potential of the hybrids, depends not only on the heterosis for the yield components, but also on adaptation to the environment, including he resistance to biotic and abiotic stresses (Chervet and Vear, 1990; Tourvieille and Vear, 1994). In the last 25 years, at AR.D.I. Fundulea, many sunflower hybrids have been released, which have ensured a continuous genetic progress for yielding potential. These hybrids have also achieved the improvement of some agronomic traits which influence the yield stability. The sunflower inbred selection fields include thousands of entries, with a very large genetic variability. The main selection criteria involve combining ability, seed oil content, productivity, resistance to diseases, pests and unfavourable environmental conditions, as well as some agronomical traits, such as: plant height, size, compaction, fertility of central area and head inclination, flowering-physiological maturity period (Vrânceanu, 2000).

The genetic progress for yield as well as for other productivity traits and adaptability assessed in breeding program suggests that there is a valuable Romanian germplasm which could lead to releasing new hybrids, with better performance in the specific conditions of Romania.

## MATERIAL AND METHODS

The paper presents the new hybrid Jupiter. This hybrid exploits the genetic diversity between the maternal inbred, with a longer vegetation period and total genetic resistance to broomrape, and the paternal inbred, much earlier, but with a good recessive branching trait, which ensure a good coincidence at flowering and an increased pollen quantity. This fact allows the manifestation into hybrid of a pronounced reproductive heterosis effect (Vrânceanu, 2000).

In order to characterize the Jupiter hybrid behaviour under various ecological conditions, data obtained during 2002-2004 from 30 trials performed in centers for variety testing were utilized. The environmental conditions during 2002-2004 were very different, both for thermic and pluviometric regime. The seed yield levels ranged between 1250 kg/ha and 4640 kg/ha, depending on the environmental conditions.

For a more accurate assessment of Jupiter physiological traits, the data obtained from ecological testing were supplemented with data obtained under artificial conditions for the resistance

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to diseases such as: downy mildew, brown spot, *Sclerotinia*) and resistance to parasites (broom-rape).

Analyses based on magneto-nuclear method were used to assess the seed oil content.

The relationship between the yield of Jupiter and yields of checks was described by the linear regressions, while the yield stability was described by variation coefficients (s%).

## RESULTS AND DISCUSSION

On average, the hybrid Jupiter produced 3,318 kg/ha with a gain of 87 kg/ha (2.7%) vs. Select. The correlated distribution of Select and Jupiter yields is described by a linear regression with a sub-unitary slope of 0.748, which indicates the tendency of Jupiter to manifest the superiority vs. Select especially under hydric stress and heat conditions. The yield variation coefficient of Jupiter was smaller but close to that of Select (Figure 1).

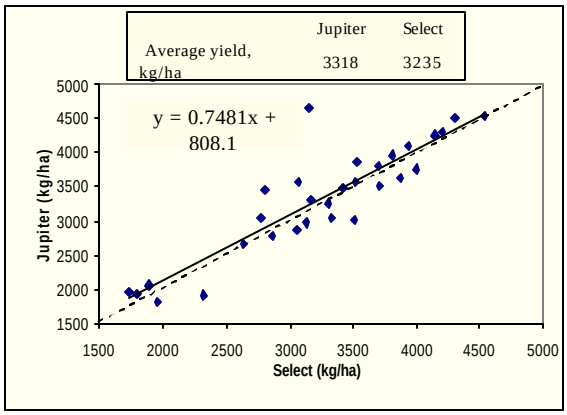


*Figure 1*. Correlated distribution of Jupiter vs. Select yields

On average, on all experimentation years, the hybrid Jupiter produced yields superior to Select in all centers, except the center in Vaslui County (Figure 2).

As compared with the hybrid Favorit, the Jupiter gave, on an average, an yield gain of 175 kg/ha (5.6%). The linear regression which describes the correlated distribution of Jupiter vs. Favorit yields has a sub-unitary value of 0.834. The hybrid Jupiter is superior to vs. Favorit in most conditions, and has a better yield stability (variation coefficient of 24.3% vs. 26.5%) (Figure 3).

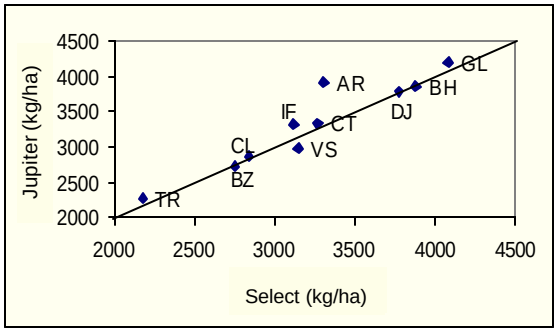


*Figure 2*. Average yields of Jupiter and Select hybrids

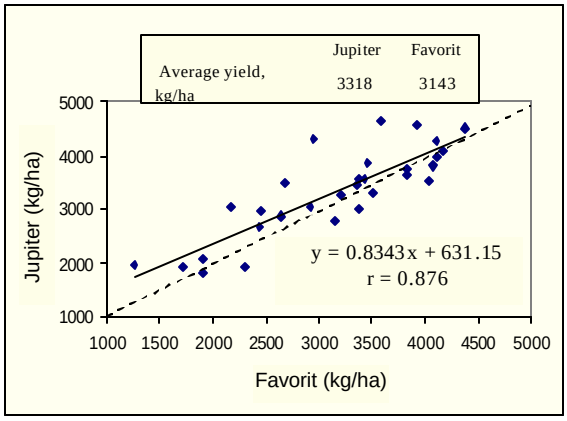


*Figure 3*. Correlated distribution of Jupiter vs. Favorit yields

On average, on all experimentation years, the hybrid Jupiter was superior, regarding the seed yield, to Favorit, in most testing centers except those from Vaslui and Constanta Counties (Figure 4).

The oil yield per hectare, which is the main aim of sunflower growing and breeding, depends on the seed yield/ha and its oil content.

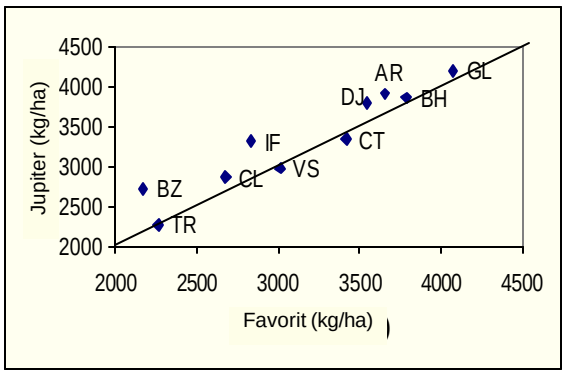


*Figure 4*. Average yields of Jupiter and Favorit hybrids.

The table 1 presents the seed oil content of Jupiter in comparison with the check hybrids, in ten locations of testing, 2002-2004 average.

The data show differences among hybrids and locations but also oil content variations of the same hybrid depending on the environmental conditions.

*Table 1*. Oil content of Jupiter in comparison with the check hybrids Select and Favorit

| County | Oil content of hybrids (%) | | |
|---|---|---|---|
| | Jupiter | Select (check) | Favorit (check) |
| Bihor | 49.8 | 46.6 | 49.9 |
| Arad | 52.2 | 49.7 | 52.1 |
| Dolj | 51.5 | 46.8 | 49.9 |
| Teleorman | 49.5 | 48.5 | 47.5 |
| Ilfov | 45.4 | 43.6 | 48.5 |
| Calarasi | 47.8 | 45.7 | 48.3 |
| Constanta | 46.8 | 44.6 | 48.0 |
| Buzau | 48.2 | 46.8 | 49.8 |
| Galati | 46.8 | 45.8 | 48.0 |
| Vaslui | 51.3 | 46.8 | 50.8 |
| LSD 5% | 2.74 | | |
| LSD 1% | 4.15 | | |
| LSD 0.1% | 6.67 | | |

On average, on three years and ten locations, the oil content of Jupiter was higher than check Select and close to that of Favorit.

The hybrid Jupiter gave an oil yield/ha superior to that of Select with 124 kg/ha, with a gain of 8.2%. Having a better resistance to unfavourable environmental conditions, the yield stability was slightly better, the variation coefficient being of 23.3% vs. 24.8%. As compared to Favorit, the oil yield gain was of 4.9% and the variation coefficient shows a better stability of Jupiter with a value of 23.3% vs. 27.3% (Figure 5).

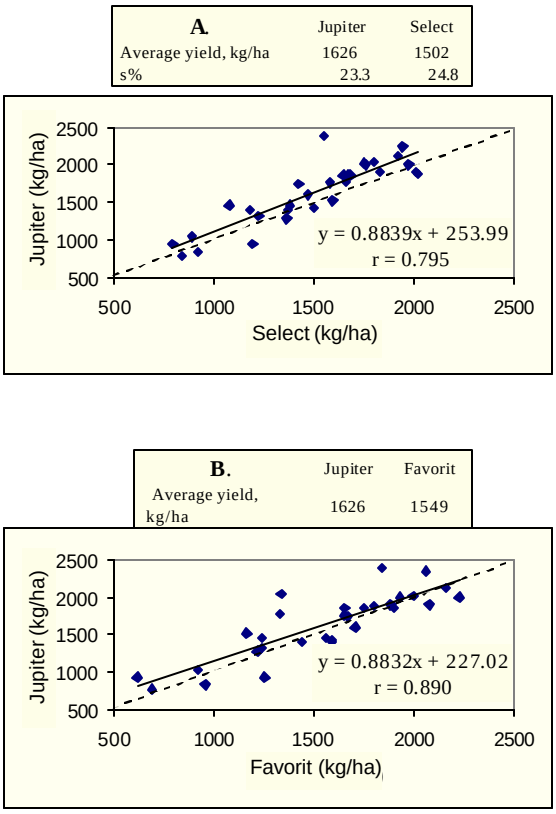


*Figure 5*. Correlated distribution of oil yields of hybrids Jupiter and Select (A) – Jupiter and Favorit (B)

As compared with one check hybrids, Jupiter has a reduced plant height, same head size and a shorter vegetation period. It is resistant to downy-mildew and broomrape, tolerant to *Phomopsis* and *Sclerotinia.* These traits allow its cultivation on a large area. The weight of 1000 kernels in Jupiter (65.1 g) was superior to Select (63.5) and close to Favorit (64.9). The test weight was also superior to Select and close to Favorit one (Table 2).

*Table 2*. Main traits of Jupiter hybrid compared with Select and Favorit checks

| Trait | Jupiter | Select (check) | Favorit (check) |
|---|---|---|---|
| Plant height (cm) | 154 | 169 | 166 |
| Head diameter (cm) | 26 | 25 | 26 |
| Vegetation period (days) | 113 | 115 | 115 |
| Resistance to diseases: | | | |
| *Plasmopara helianthi* | Resistant | Resistant | Resistant |
| *Phomopsis helianthi* | Tolerant | Resistant | Middle-resistant |
| *Sclerotinia sclerotiorum* | Tolerant | Tolerant | Tolerant |
| Resistance to parasites: | | | |
| *Orobanche cumana* | Resistant | Sensitive | Resistant |
| TKW (g) | 65.1 | 63.5 | 64.9 |

| | | | |
|---|---|---|---|
| Test weight (kg/hl) | 40.3 | 39.0 | 40.0 |

The large number of branches produced by the male inbred ensures a long duration of pollen release, allowing a good pollination of the female inbred (Table 3).

*Table 3.* Flowering period of Jupiter parental forms expressed in days from sowing time (Fundulea, 2002-2004)

| Maternal inbred | 1% | | | | | | | | | 75% | | | 100% | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Days | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 |
| Paternal inbred | main head | 20% | | | | 75% | | | | | 100% | | | | | | | | |
| | secondary heads | | | | | | 2% | | | | | | | 75% | | | | | 100% |

Flovering duration on head: maternal inbred = 9 days; paternal inbred – main head = 5 days;
paternal inbred – secondary heads = 3 days;
average number of branches = 6.2/plant.

## CONCLUSIONS

The new semi-late hybrid Jupiter, resistant to *Orobanche cumana* is recommended in areas where this parasite is frequently found.

The yielding capacity of this new hybrid is superior to checks and the other agronomic traits proved to be similar or more favourable as compared with the checks.

The oil yield stability, expressed by the variation coefficient was better for Jupiter as compared to checks.

The seed multiplication is efficient and the branched paternal inbred ensures a good pollination, favouring the higher hybrid seed yields.

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