

## Some Fundamentals for Breeding *Rudbeckia* Species®

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### INTRODUCTION

The genus *Rudbeckia* is in the family Asteracea and comprises approximately 30 species. All are native to North America. The species mix is biased toward long-lived perennials but there are a few that are short-lived perennials and one species, *R. hirta* is an annual. The perennials species most encountered are *R. fulgida* and its several varieties, *deamii*, *sullvanti*, *fulgida*, and *speciosa*. *Rudbeckia fulgida* var. *sullvanti* is a very prominent garden plant represented by the well known cultivar Goldsturm. The true name being *R. fulgida* var. *sullvanti* cv. Goldsturm. Other *rudbeckia* garden plants that are frequently encountered are *R. fulgida* var. *fulgida* and *R. subtomentosa*. *Rudbeckia hirta* has given rise to numerous cultivars and it serves as the flag ship for most breeding efforts even though it is an annual. Its flower variations and colors exceed all of the other perennial forms for range.

### BREEDING WORK OBJECTIVES

Most of the cultivars of the perennial forms have occurred as spontaneous mutations or seedling variations. Perhaps the most well known is *R. fulgida* var. *sullvanti* cv. Goldsturm.

This plant was found in Germany and after some effort made its way back home to North America. It is a tetraploid and is self sterile and produces seeds apomictically (Palmer et al., 2007.)

It has many characteristics which make it very desirable. It blooms heavily, is naturally short in stature, and is generally immune to most pest problems. Because it gives rise to parthenocarpic seeds its propagation is straight forward because all of the seeds give rise to daughter plants that are identical to the mother. Hundreds of thousands of 'Goldsturm' are raised every year from seed. Other perennial species, such as *R. missouriensis*, and *R. subtomentosa* are also good garden plants and exhibit good disease and pest resistance. *Rudbeckia fulgida* var. *fulgida*, although considered by some to be a worthy plant is not as versatile as 'Goldsturm'. Few of the natural forms of *R. missouriensis* or *R. subtomentosa* lend themselves to the massive production capabilities of 'Goldsturm'. *Rudbeckia missouriensis* is desirable however its stature is tall and rangy where as 'Goldsturm' and its even shorter cousin, *R. fulgida* var. *sullvanti* 'Pot of Gold' are much more compact and more applicable to usual garden conditions.

All *rudbeckia* have interesting flowers with 'Goldsturm', 'Pot of Gold', and *R. missouriensis* being some of the best for the perennial species. Breeding efforts to combine the positive flowering characteristics of any of the more wild species with that of 'Goldsturm' should give rise to some superior plants both in terms of disease resistance and to enhanced flowering capability.

### THE MALE PARENT

'Goldsturm' is self sterile and under normal circumstances in cultivation the flowers rarely if ever produce pollen. Flowering in 'Goldsturm' occurs in two cycles. The

initial one produces large showy flowers and the cycle will last for several weeks from the onset.

None of these flowers will produce pollen. Being self sterile it seems that theoretically there might not be a need for pollen as it serves no purpose. However, in the second cycle of flowering much smaller flowers are produced and they originate from small spurs emanating from the main stem that produced the original terminal flowering flush. If the whole stem is removed and the terminal flower is discarded, what remains is the much smaller and less showy round two flowers. If the stem is then wounded much as though it were being prepared as a cutting and then cut under water to eliminate air bubbles in the vascular tissue similar to that of a cut flower, the second flush of flowers can be made to produce pollen. Once the spur flowers are prepared accordingly they can be inserted in a vessel or vase filled with a 50% solution of water and either ginger ale or lemon-lime soda. After about 3 to 5 days, approximately 50% of the spur flowers will show the emergence of stamens and copious amounts of pollen. Caution should be exercised to be on the lookout for an unknown species of inchworm that devours the newly formed stamens (Fig. 3). If a good pollen set is at hand the stage is ready for moving this pollen to its new home.

### THE FEMALE PARENT IN WAITING

*Rudbeckia missouriensis* flowers almost at the same time as 'Goldsturm' albeit about 5 to 10 days after the initial flush of 'Goldsturm'. This is actually good, because by the time the flowers of *R. missouriensis* are receptive, the spur flowers of 'Goldsturm' if forced are ready.

The flowers of *R. missouriensis* are quite showy and attract a good many pollinating insects such as bees, flies, and butterflies. If, however, the ray flowers are removed, leaving nothing but the central cluster of fertile female flowers, the visitation of pollinating insects is greatly reduced. During the course of development the fertile female flowers will swell and change color from a pink lavender to a much darker red giving rise to a red-brown. At this point pollination can be achieved by directly applying the pollen from the 'Goldsturm' spur flowers to the female portions of the *R. missouriensis*. *Rudbeckia missouriensis* is a diploid and should yield triploid seedlings if fertilization with 'Goldsturm' pollen is effective. The appearance of the flowers that have been pollinated will change again to a much darker color and after a few days, the flowers of *R. missouriensis* will produce their own pollen. But because of the absence of the rays, interloper insects fail to visit the flowers. While not full proof, it is thought that self pollination is limited by this move although this does not preclude the formation of parthenogenic seed.

### GESTATION AND NEW FORMS

Once the fertilized flowers are starting to undergo senescence by turning brown throughout it is prudent to bag them so that any loose seed will not fall out by the actions of wind or other physical movement. The dried seed heads can be cut and stored for several months and allowed to dry out completely. At this stage the resultant seed can be easily removed, subjected to 60 to 90 days cold-moist stratification and then after that period, sown and placed in a warm environment to germinate. Palmer et al (2007) reports though their breeding produced only one hybrid seedling from a multitude of interspecific crosses, although many apomictic

seedlings did develop. Apomictic seed commonly develops as a result of pollination even though the pollination is ineffectual. Obviously, the pairing of rudbeckia for hybridization requires more understanding.

#### LITERATURE CITED

Palmer, I.E., T.G. Ranney, N.P. Lynch, and R.E. Bir. 2007. Exploring crossability among *Rudbeckia* L. species. Proc. SNA Res. Conf., 52nd Ann. Rpt. Southern Nurseryman's Association, Athens, GA.