

Taraxacum Improvement via Apomixis

Ron Fioritto, Scott Wolfe, and Debbie Zaborski

Introduction:

Apomixis is defined as asexual reproduction, or cloning through seeds (Nogler, 1984; Asker and Jerling, 1992).

It is a genetically controlled reproductive process where seeds are developed without fertilization. Seeds produced are clones of the mother plant.

Benefits of apomixis:

- Set seeds without fertilization (pollination not needed)
- Plants grown from seeds are clones of the mother plant
- Enables selection of individual plants with superior characteristics
- The genotype of every apomictic is fixed in the F1 generation and every apomictic genotype from a cross has the potential of being a cultivar
- Gene combinations and vigor are maintained over generations as opposed to segregating generations in sexual F1 hybrids
- Increased ploidy level (larger more vigorous plants)
- Simplifies the maintenance of elite genotypes and eliminates the need for isolation to produce high quality pure seed

Goal:

Integrate the apomixis trait with advanced TK selections from the high rubber recurrent selection program.



Figure 1: Comparison of seed set:
Left: *Taraxacum kok-saghyz*
Right: *Taraxacum brevicorniculatum*

Plan 2016

Cross:
(diploid sexual high rubber TK clones)
X
(triploid apomictic medium rubber T(X))

Make 100 crosses; try for 20 F1 seedlings per cross

TK (2n sexual) x TX (3n apomictic)

Potential Results of Cross: (Tas, et al; Figure 3B)

- 89% selfs
 - Mentor effect (De Nettancourt, 1977)
- 2% True 2n hybrids
- 6% 3n of which 1/3 are apomictic
- 3% 4n of which all are apomictic

Test progeny for apomixis

- Emasculate 2 flowers per plant
- Select and test apomictic progeny for:
- Ploidy Number
 - Percent Rubber

Cross apomictic type with best individual from recurrent selection program (Figure 3A)

Increase probability of getting a 3n apomictic type by crossing with the 4n apomictics (Figure 3B)

TK (2n sexual) x TX (4n apomictic)

TK (2n) x TX 4n apomictic

- 55% 3n non-apomictic
- 45% 3n apomictic



Figure 2: Hand pollination of TK

Integrating Recurrent Selection and Apomixis

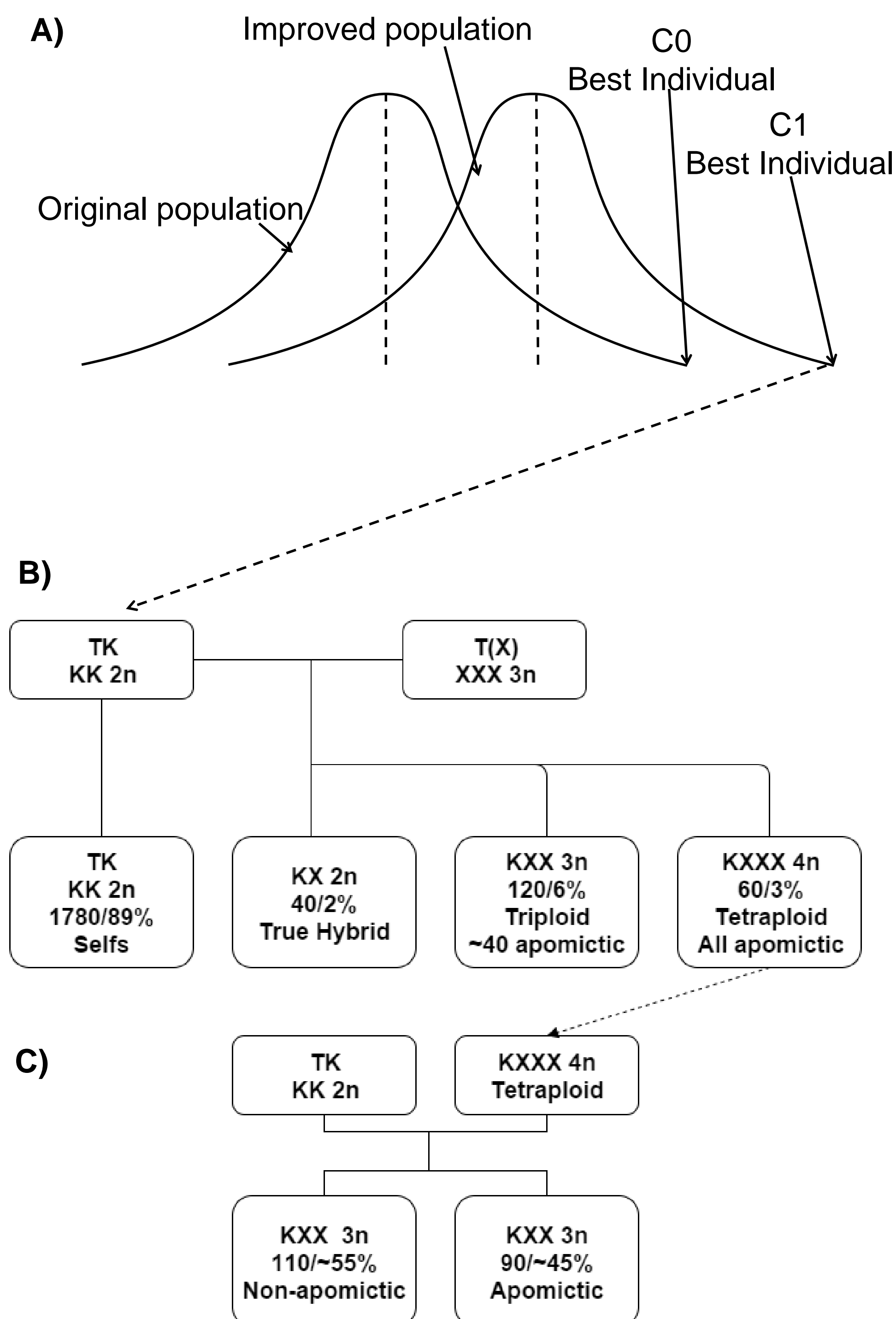


Figure 3:
A) Recurrent Selection of High Rubber
B) Potential results of TK (2n sexual) x TX (3n apomictic)
C) Potential results of TK (2n sexual) x TX (4n apomictic)

Figure 4: Top: *Taraxacum albidum*;
Bottom: *Taraxacum pseudorosaeum*



CONCLUSIONS

Apomixis can simplify the process of commercial hybrid and cultivar production, enabling economical large scale seed production. It can also lead to a larger more vigorous type of plant that produces clones as seeds without fertilization.

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ACKNOWLEDGEMENTS

Funding was provided by the PENRA Consortium, Ohio Third Frontier, OARDC, and USDA NIFA Hatch Project 230837.