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ART XLI.—*Experiments in Cross-Breeding Plants of the same variety*; by Professor W. J. BEAL.

EARLY in the spring of 1877, the writer received the first review of Darwin's book on "The Effects of Cross and Self-fertilization of Plants." The book seemed to be a most instructive production, one which has not been excelled in importance to the farmer by any work in this or in any age. But, in the words of the Gardener's Chronicle, "It is certain that these practical results will be a long time filtering into the minds of those who will eventually profit most by them." If the results are so valuable, and if it will take a long time to reach the farmers, this "filtering" process cannot begin too soon, nor be too continuously kept before them. The writer lost no time in trying similar experiments on several of our cultivated plants, as apples, onions, Indian corn and beans.

Experiments with Indian corn.—Yellow dent corn was obtained from two men in different portions of Michigan. In one case the corn had been kept ten years or more on the same farm, and in the other case fifteen years or more on the same farm. In both cases the corn was much alike. The two lots of corn were planted in alternate rows in a plot by itself. The tops of one set of rows were all cut off, thus securing a perfect cross on those stalks. Seed from this cross was saved and planted to compare with corn not so crossed. The yield from the crossed seed exceeded the yield of that not crossed, as one hundred and fifty-three (153) exceeds one hundred (100).

Crossing black wax beans.—There were, as shown in the plat below, eight short rows two feet apart with the plants finally thinned on July 10th, to five plants about fifteen inches apart

in the row. The seed for half the rows (alternating) is called "old stock," and was raised in the garden the previous year from seeds which descended from those raised on the place for nine years or more.

The "crossed stock" was obtained as follows: in 1877, some seeds of the same variety of beans were purchased of James Vick. These were planted in a drill evenly mixed with seeds of the old stock. These grew and looked alike, but the flowers were inter-crossed by bees. Seeds of this crop are termed "crossed stock."

On May 31, 1878, fifteen seeds were planted in each of the eight rows. The plants from the crossed seeds were generally much the largest and as will be seen kept green the longest.

In ten days after planting, seeds of the old stock came up in each row as follows:----- 4, 7, 7, 9=27

In ten days the crossed stock came as follows: 12, 10, 6, 11=39

In seventeen days the old stock came as follows: 7, 11, 10, 10=38

" " " crossed " " " 12, 13, 10, 14=49

On July 22, the pods fit for cooking on each plant numbered as follows. The pods on the two lots of plants were about alike in size.

Old stock	36	1	dead	7	13 = 57	
Crossed stock	dead	0	0	41	0 =	41
Old stock	0	0	8	0	11 = 19	
Crossed stock	6	22	34	0	17 =	79
Old stock	30	0	0	0	0 = 30	
Crossed stock	41	37	21	31	0 =	130
Old stock	0	0	0	0	2 = 2	
Crossed stock	16	29	30	26	2 =	103
Total old stock					= 108	
Total crossed stock					= 353	

This variety is greatly raised for the purpose of supplying an early crop of beans to eat pods and all while young. The difference will be seen to be over three to one in favor of the crossed stock.

On August 9, the pods fit for cooking or past that condition were as follows:

Old stock	52	60	dead	43	45 = 200	
Crossed stock	dead	24	16	51	83 =	174
Old stock	38	46	44	71	37 = 236	
Crossed stock	35	52	58	69	62 =	276
Old stock	39	34	30	47	87 = 237	
Crossed stock	63	48	11	66	61 =	249
Old stock	38	46	54	33	39 = 210	
Crossed stock	38	90	52	88	81 =	340
Total old stock					= 883	
Total crossed stock					= 1048	

On or before September 16, all were harvested. The pods on each plant numbered as follows:

Old stock	60	62	dead	45	39	=	206
Crossed stock	dead	160	54	29	139	=	382
Old stock	45	48	36*	71	37	=	237
Crossed stock	36	145	91	72	51	=	395
Old stock	45	35	37	38	35†	=	190
Crossed stock	103	68	55	128	75	=	429
Old stock	30	39	48	28	40	=	185
Crossed stock	136	159	58	172	128	=	653
Total old stock							= 818
Total cross stock							= 1859

On comparing the table for August 9th, with that for September 16, it will be seen that some plants of the old stock had lost part of their fruit. This was on account of the decay of 101 pods. The table also shows that two branches were broken and had died before maturing. These contained 73 pods.

Adding 101 and 73 to 818, we have 992 pods of the old, against 1859 of the crossed. In harvesting, all those pods badly damaged were rejected. The beans of the old stock weighed 29.77 ounces avoirdupois, those of the crossed stock weighed 70.33 ounces avoirdupois, or nearly in the proportion of 100 to 236.

The difference would be a little less, if we allow for the broken plants and decayed pods on the old stock. One plant of the old and one plant of the crossed stock died early and produced no fruit.

Six lots of 50 beans each, were taken at random from the old stock and weighed as follows:

50 seeds	281 grains.	50 seeds	260 grains.
50 seeds	262 grains.	50 seeds	259 grains.
50 seeds	270 grains.	50 seeds	284 grains.
Total, 1,616 grains.		Average, 269 $\frac{2}{3}$ grains.	

The same number of seeds were taken from the crossed stock and weighed as follows:

50 seeds	220 grains.	50 seeds	210 grains.
50 seeds	219 grains.	50 seeds	210 grains.
50 seeds	200 grains.	50 seeds	220 grains.
Total, 1,279 grains.		Average, 213 $\frac{1}{6}$ grains.	

The average weights of an equal number of beans from each stock were nearly as 100 to 79 in favor of the *old* stock.

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* This plant contained a dead branch with 21 immature pods.

† This plant contained a dead branch with 52 immature pods.