Assignment

EE23010: Probability and Random Processes
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Question: A cytoplasmic male-sterile female plant with the restorer (nuclear) genotype *rr* is crossed to a male-fertile male plant with the genotype *RR*. Both *RR* and *Rr* can restore the fertility, whereas *rr* cannot. When an $F1$ female plant with *Rr* genotype was test-crossed to a male-fertile male plant with the *rr* genotype, the percentage of the population that is male fertile would be?

Solution:

On crossing between *rr* and *RR* we get:

	R	*R*
r	*Rr*	*Rr*
r	*Rr*	*Rr*

TABLE 0
Table1: Crossing btw *RR* and *rr*

$$F_1 = Rr, Rr, Rr, Rr \tag{1}$$

When F_1 (Rr) is test-crossed with *rr* we get:

	r	*r*
R	*Rr*	*Rr*
r	*rr*	*rr*

TABLE 0
Table2: Crossing btw *Rr* and *rr*

Now, Let X be the random variable representing the genotype of the male offspring.

$$X = \begin{cases} 1 & Rr \\ 0 & rr \end{cases} \tag{2}$$

So, From the table 0 we know:

$$p_X(1) = \frac{1}{2} \tag{3}$$

$\therefore$ The percentage of the population that is male fertile would be 50%