

AlSharawi, Z.; Burstein, A.; Deadman, M.; Umar, A.

The solution of a recursive sequence arising from a combinatorial problem in botanical epidemiology. (English) [Zbl 1274.92048](#)

J. Difference Equ. Appl. 19, No. 6, 981-993 (2013).

Summary: One of the central problems in botanical epidemiology is whether disease spreads within crops in a regular pattern or follows a random process. In this study, we consider a row of n plants in which m are infected. We then develop a rigorous mathematical approach to investigate the total number of ways to obtain k isolated individuals among m infected plants. We give a recurrence relation in three parameters that describes the problem, then we find a closed-form solution, and give two different approaches to tackle the proof. Finally, we find interesting formulae for the expectation and variance of the random variable that represents the number of infected and isolated plants.

MSC:

[92D30](#) Epidemiology
[65Q30](#) Numerical aspects of recurrence relations
[05A05](#) Permutations, words, matrices
[05A15](#) Exact enumeration problems, generating functions

Cited in **1** Review
Cited in **1** Document

Keywords:

spread of disease; recurrence relation; binomial coefficients; hypergeometric function

Full Text: [DOI](#)

References:

- [1] DOI: 10.1139/b05-087 · [doi:10.1139/b05-087](#)
- [2] Brualdi R.A., *Introductory Combinatorics*, 5. ed. (2010)
- [3] Campbell C.L., *Introduction to Plant Disease Epidemiology* (1990)
- [4] DOI: 10.1201/9781420072686 · [Zbl 1184.68373](#) · [doi:10.1201/9781420072686](#)
- [5] DOI: 10.1094/Phyto-83-759 · [doi:10.1094/Phyto-83-759](#)
- [6] DOI: 10.1007/978-3-642-75398-5_6 · [doi:10.1007/978-3-642-75398-5_6](#)
- [7] DOI: 10.2307/2265572 · [doi:10.2307/2265572](#)
- [8] DOI: 10.1094/PHYTO.2001.91.10.1001 · [doi:10.1094/PHYTO.2001.91.10.1001](#)
- [9] DOI: 10.1094/PHYTO.1997.87.3.325 · [doi:10.1094/PHYTO.1997.87.3.325](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.