Construction of Minimal Connected Network with Proteins Affected By Expression of the Rol B Plant Oncogene

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Abstract

In this paper, a construction of minimal connected network with proteins, affected by expression of the rol B plant oncogene, is making, using concept of connectivity components. In this paper, Arabidopsis protein signaling network G affected by expression of the rol B plant oncogene, is considered. Biochemists experimentally defined in the network G the set U_0 of proteins, which tested the effect of the rolB plant oncogene [1].

Clinical Image

All these proteins are marked with octagons on Figure 1. A problem is to define in the network G connected sub network G_* with minimal number of proteins including the set of proteins U_0 and their nearest neighbors. To solve this problem we calculated minimal ways lengths from proteins, which are not describing by octagons to proteins described by octagons, using Dijkstra algorithm [2]. It is showing that there is the set U_1 of 21 proteins with minimal distance 1 to the set U_0, and they are nearest neighbors of proteins describing by octagons on Figure 1. So all, these proteins are to be included to the sub network G_* also. In the network G, there are the set U_2 of 26 proteins, which have minimal distance 2 to the set U_0 and the set U_3 of three proteins, which have minimal distance 3 to the set U_0. So total number of proteins in the graph G equals 50. To construct the connected sub network G_*, including the sets U_0, U_1 with minimal number of proteins, we consider the graph G_1 with proteins from the sets U_0, U_1 and edges between them. The graph G_1 has two connectivity components G_1^1, G_1^2. To connect them it is enough to include in the network G_* additionally to the sets U_0, U_1 only the single protein SOS2.
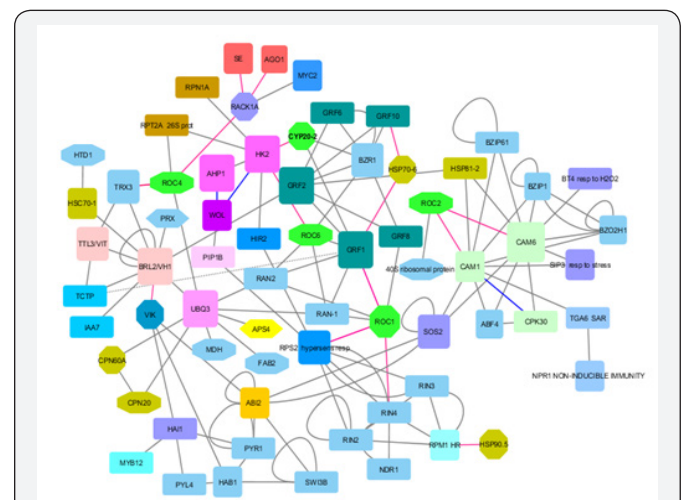

Figure 1: Arabidopsis protein signaling sub network with proteins affected by expression of the rol B plant oncogene.
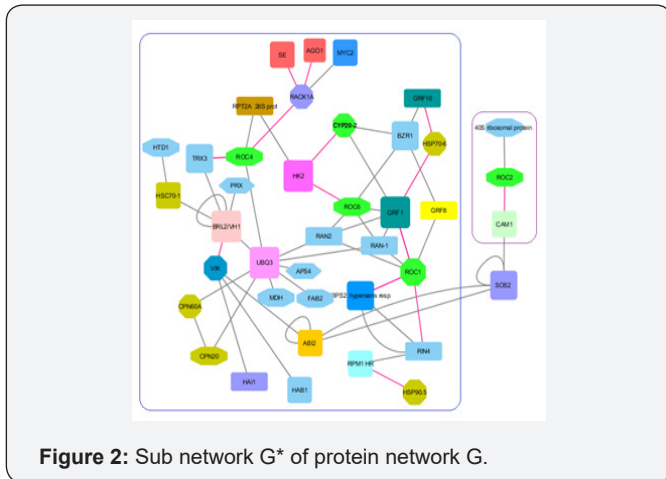
Figure 2: Sub network G* of protein network G.

In Figure 2 describe the network G_* the sub networks G_1^1, G_1^2 are surrounded by blue and lilac rectangles corresponding.

Total number of the graph G_* proteins equals 22, not 50 as in the network G. Therefore, main part of proteins of the sets U_2, U_3, play in the network G a role of provinces not a role of a connective tissue. This solution is not general for considered mathematical problem, which is N-P problem. Nevertheless, a specific of considered network G allows to construct the sub network G_* and to make meaningful interpretation of obtained result using only Cytoscape representation of the network G.

References

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