Identification Of Anticancer Plants

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Abstract

Aim: To use common external morphological features among proven anticancer plants to identify potential plant sources of anticancer drugs.

Study: Eight (8) proven anticancer plants, whose extracts are used as drugs in clinical settings, were selected for this study. Along with that, twelve (12) plants, which were investigated by other researchers for anticancer activities were also selected. These twelve plants were termed as candidate plants in this study. Eight external morphological features which are similar in descriptions or absence among majority of proven anticancer plants were noted. Out of eight, six external morphological features, which were similar in descriptions or absence among majority of candidate plants and proven anticancer plants together, were also noted. This set of six common external morphological features is referred to as C.E.M.F.G. There are total 4 (four) different C.E.M.F.G's based on various descriptions or absence of any of the six features. Within those individual C.E.M.F.G's, the remaining two out of total eight selected morphological features were compared between candidate plant and proven plants.

Results: Six (6) proven anticancer plants shared all eight similar external morphological features among themselves either by their descriptions or absence in their respective C.E.M.F.G's. Two candidate plants bearing all eight identical external morphological features of proven anticancer plants, either by their descriptions or absence in their respective C.E.M.F.G's were identified as Eugenia jambolana and Salix alba. These two candidate plants can possibly be sources of effective anticancer drugs like proven anticancer plants. Therefore, they need to be investigated further for their anticancer activities.

Conclusion: Plants with above mentioned set of similar external morphological features have similar medicinal effects i.e. anticancer activities.

INTRODUCTION

Life on this planet evolved from unicellular organisms to present day life forms, which includes humans. This evolutionary process is engineered by nature over billions of years. To find solutions to structural and functional abnormalities or diseases afflicting human body is difficult. Some of them can be treated. But there are illnesses like cancer which are still difficult to treat. Therefore, various sources are sought for answers. One of those sources are plants. This work is about finding similarity of external morphological features among proven anticancer plants. Thereafter, other plants investigated for similar anticancer activities by other researchers bearing similar external morphological features as proven anticancer plants are identified.

AIM:

Identify possible sources of anticancer drugs among plants which are under investigation for anticancer activities by other researchers, based on their external morphological features.

(a) Identify external morphological features, which are similar by descriptions or absence among proven anticancer plants.

(b) Identify plants under investigation for anticancer activities by other researchers bearing above mentioned set of similar external morphological features.

MATERIALS:

(A)Plants based anticancer pharmacological agents are given below.

(B) Plants, whose extracts are investigated by other researchers for their anticancer activities (Candidate plants).

1. EUGENIA JAMBOLANA LAM.[12]
2. LAVANDULA ANGUSTIFOLIA[13]
3. MENTHAVIRIDIS L.[22]
4. OCIMUM SANCTUM[14]
5. PATRINIA VILLOSA[15]
6. PHYSALIS ANGULATA L.[16]
7. PERILLA FRUTESCENS L.[17]
8. SCUTELLARIA BAICALENSIS[18]
9. SOLANUM NIGRUM[23]
10. SALVIA OFFICINALIS[19]
11. SALIX ALBA[20]
12. CURCUMA LONGA[21]

METHODS:

Eight (8) proven anticancer plants and twelve (12) plants investigated by other researchers for anticancer activities termed as candidate plants in this work were selected. Proven anticancer plants were first compared among themselves and then along with candidate plants.

Eight (8) external morphological features were identified which were similar by descriptions or absence among majority (six out of total eight) of proven anticancer plants. These eight external morphological features were further used to compare proven anticancer plants with candidate plants in two steps. Eight (8) external morphological features were: (1) Erect or non erect, (2) Stipule present or not, (3) Petiole present or not, (4) Leaf is either simple or compound, (5) Position of Ovary-Epigynous or hypogynous or perigynous, (6) Flowers-Bisexual or unisexual, (7) Sepal-present or not or whether they were separate or fused, and (8) Petal-present or not or whether they were separate or fused.

In a first step, only six out of above mentioned eight external morphological features common to proven anticancer and majority of candidate plants were noted. These six common external morphological features were: (1) Erect or not erect, (2) Stipule present or not, (3) Petiole present or not, (4) Leaf is either simple or compound, (5) Flowers unisexual or bisexual and (6) Position of Ovary-Epigynous or hypogynous or perigynous. The above mentioned group of six common external morphological features is referred to as COMMON EXTERNAL MORPHOLOGICAL FEATURE GROUP or C.E.M.F.G. Reason for including less number of common external morphological features for forming C.E.M.F.G is for accommodating a maximum number of candidate plants for comparison and ease data analysis within a given C.E.M.F.G. C.E.M.F.G consists of a string of 6 alphabets (codes). Each of these alphabets (codes) is the first letter, representing the description of an external morphological feature. Different combinations of letters are strung together. Some of the C.E.M.F.G's lack one or more than one letter due to absence of certain external morphological features or they are indistinguishable. There are total 4 (four) COMMON EXTERNAL MORPHOLOGICAL FEATURE GROUPS. In next step, plants in each C.E.M.F.G were further compared with each other in tables 1a, 2a, 3a & 4a on the basis of remaining two (2) external morphological features consisting of: (1) Presence and absence of Sepals which may or may not be fused and (2) Presence and absence of Petals which may or may not be fused. In each C.E.M.F.G, candidate plants may be grouped along with proven anticancer plants.

Codes that make up COMMON EXTERNAL MORPHOLOGICAL FEATURE GROUP:

1. Non erect/Climber (N) or Erect(E)
2. Presence of stipule(S) or Exstipulate(E)
3. Presence of petiole(P) or sessile(S)
4. Type of leaf-simple(S) or compound(C)
5. Flower gender: Bisexual (B) or Unisexual (U)
6. Position of Ovary (H for Hypogynous, E for Epigynous and P for Perigynous)

Codes allotted to next two (2) external morphological features for comparison within allotted C.E.M.F.G's:

1. Sepal: Gamosepalous (G) or Polysepalous (P) or Nil
2. Petal: Gamopetalous (G) or Polypetalous (P) or Nil

Codes mentioned above are first letters representing descriptions of external morphological features. Descriptions of external morphological features were based on relevant literature.

Sets of similar codes representing proven anticancer plants are used to identify candidate plants, which are more likely to yield anticancer drug(s).

REVIEW OF LITERATURE:

Plants are of immense value to humans in the form of food, shelter, clothing, medicines…..etc. Their uses have been detailed in various reports of ancient times from different parts of the world. An ancient medical text from China, "Shen Nung Pen Ts'ao Ching", contains information about use of medicinal herbs25, 26. "Charaka Samhita27", an ancient literature from India also described use of medicinal plants. "De Materia Medica28" by Pedanius Dioscorides

(c.40-c.90), classified medicinal plants based on properties of their extracts. Ãbu Hanifar Ãhmad ibn Dawùd Dinawari or Al-Dinawari (828-896 A.D) in his work "Kitab Al-Nabat24", described plants useful for ailments afflicting humans. Efforts to identify medicinal plants began from ancient days and are still continuing on.

In this work, an effort is made to identify plants, which can possibly be a source of effective anticancer drug(s) like proven anticancer plants based on similarity of their external morphological features. Plants detailed in this study are proven anticancer plants and plants under investigation for anticancer activities by other researchers.

OBSERVATIONS:

A. Proven anticancer plants

(I) Common External Morphological Feature Group: E-E-P-S-B-H (Erect-Exstipulated-Petiolated-Simple-Bisexual-Hypogynous)

1. PODOPHYLLUM PELTATUM[1,2,7]
2. CATHARANTHUS ROSEUS[1,2,3]
3. BLEEKERIA VITIENSIS[1,2,5]
4. MAYTENUS OVATUS[9,10]

(II) Common External Morphological Feature Group: E-E-P-S-B-E (Erect-Exstipulated-Petiolated-Simple-Bisexual-Epigynous)

1. CAMPTOTHECA ACUMINATA[1,2,6]

(III) Common External Morphological Feature Group: E-S-P-S-U (Erect-Stipulated-Petiolated-Simple-Unisexual-Nil-Nil)

1. TAXUS BREVIFOLIA[1, 2, 8]
2. CEPHALOTAXUS HARRINGTONIA[1,2,11]

(IV) Common External Morphological Feature Group: E-E-P-S-U-H (Erect-Ex stipulated-Petiolated-Simple-Unisexual-Hypogynous)

1. EUPHORBIA PEPLUS[4]

B. Candidate plants

(I) Common External Morphological Feature Group: E-E-P-S-B-H (Erect-Exstipulated-Petiolated-Simple-Bisexual-Hypogynous)

1. PHYSALIS ANGULATA[16]
2. SOLANUM NIGRUM[23]
3. SCUTELARIA BAICALENSIS[18]
4. LAVANDULA ANGUSTIFOLIA[13]
5. PERILLA FRUTESCENS L.[17]
6. OCIMUM SANCTUM[14]
7. MENTHAVIRIDIS L.[22]
8. SALVIA OFFICINALIS[19]

(II) Common External Morphological Feature Group: E-E-P-S-B-E (Erect-Exstipulated-Petiolated-Simple-Bisexual-Epigynous)

1. CURCUMA LONGA[21]
2. PATRINIA VILLOSA[15]
3. EUGENIA JAMBOLANA LAM.[12]

(III) Common External Morphological Feature Group: E-S-P-S-U (Erect-Stipulated-Petiolated-Simple-Unisexual-Nil-Nil)

1. NONE

(IV) Common External Morphological Feature Group: E-E-P-S-U-H (Erect-Ex stipulated-Petiolated-Simple-Unisexual-Hypogynous)

1. SALIX ALBA[20]

Proven anticancer plants and candidate plants from each group were compared with each other on the basis of rest two (2) external morphological features. For example: (I) with (I), (II) with (II), and so on. Trends are then noted.

1. P.A-PHYSALIS ANGULATA L.[17]
2. M.O-MAYTENUS OVATUS[9,10]
3. B.V-BLEEKERIA VITIENSIS[1,2,5]
4. C.R-CATHARANTHUS ROSEA[1,2,3]
5. P.P-PODOPHYLLUM PELTATUM[1,2,7]
6. S.N-SOLANUM NIGRUM[23]
7. S.B-SCUTELLARIA BAICALENSIS[18]
8. L.A-LAVANDULA ANGUSTIFOLIA[13]
9. P.F-PERILLA FRUTESCENS L.[17]
10. O.S-OCIMUM SANCTUM[16]
11. M.L-MENTHAVIRIDIS L.[22]
12. S.O-SALVIA OFFICINALIS[19]

1. C.A-CAMPTOTHECA ACUMINATA[1,2,6]
2. C.L-CURCUMA LONGA[21]
3. P.V-PATRINIA VILLOSA[15]
4. E.J-EUGENIA JAMBOLANA[12]

1. T.B-TAXUS BREVIFOLIA[1,2,8]
2. C.H-CEPHALOTAXUS HARRINGTONIA[1,2,11]

1. E.P-EUPHORBIA PEPLUS[4]
2. S.A-SALIX ALBA[20]

DISCUSSION:

Bleekeria vitiensis and Catharanthus roseus, both proven anticancer plants follow similar sequence E-E-P-S-B-H-POLYSEPALOUS-GAMOPETALOUS. Podophyllum peltatum and Maytenus ovatus, both proven anticancer plants also share a similar sequence E-E-P-S-B-H-POLYSEPALOUS-POLYPETALOUS.

Camptotheca acuminata, a proven anticancer plant and Eugenia jambolana, a candidate plant follow similar sequence of features: E-E-P-S-B-E- GAMOSEPALOUS-POLYPETALOUS. Eugenia jambolana can possibly be source of effective anticancer drug(s) like the proven anticancer plant. Eugenia jambolana needs to be studied further for anticancer activity.

Both proven anticancer plants follow similar sequence E-S-P-S-U-NIL-NIL - NIL. But no candidate plant(s) is detailed with identical sequence in the above mentioned C.E.M.F.G.

Euphorbia peplus, a proven anticancer plant along with Salix alba, a candidate plant follow similar sequence i.e., E-E-P-S-U-H NIL - NIL. Salix alba can possibly be source of effective anticancer drug(s) like the proven anticancer plant. Salix alba needs to be studied further for its anticancer activities.

CONCLUSION:

Eight (8) proven anticancer plants, whose extracts are used in clinics as drugs were selected for this study. Twelve (12) plants investigated by other researchers for anticancer activities, termed as candidate plant in this work were also selected for this study. Initially, eight external morphological features which were similar by descriptions or absence among the majority (six) proven anticancer plants were noted. In a next step, six out of above mentioned eight common external morphological features which are similar in descriptions or absence among majority of candidate plants and proven anticancer plants were referred to as Common External Morphological Feature Groups (C.E.M.F.G's) were also noted. The reason for selecting only six external morphological features was to accommodate the maximum number of candidate plants for further comparison and to ease data analysis. There were total four different Common External Morphological Feature Groups based on various descriptions or absence of any of the above mentioned six external morphological features. Within each of these Common External Morphological Feature Groups, the remaining two external morphological features of proven anticancer plants were further compared with that of candidate plants. Six proven anticancer plants shared similar sequences of external morphological features among themselves in groups of two's, either by their descriptions or absence within their respective C.E.M.F.G's. The only exceptions were Euphorbia peplus and Camptotheca acuminata; both are proven anticancer plants. But there are no proven anticancer plants with similar external morphological features for comparison. This comparative study (Table-2a & 4a) also shows two candidate plants, consisting of Eugenia jambolana and Salix alba, bearing same features akin to proven anticancer plants with in their respective C.E.M.F.G's. Eugenia jambolana and Salix alba can possibly be sources of effective anticancer drugs like proven anticancer plants. Therefore, they need to be studied further for their anticancer activities. The same set of external morphological features are not displayed by other candidate plants in their respective C.E.M.F.G's.

Plants with above mentioned set of similar external morphological features have similar medicinal effects i.e. anticancer activity. These findings may be of help in identifying plants with targeted effects like the proven plants, drawn in from candidate plants, based on similarity of external morphological features.

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