Review article

Avicenna's Canon of Medicine: a review of analgesics and anti-inflammatory substances

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Abstract

Naturally occurring substances mentioned in medieval medical literatures currently have, and will continue to have, a crucial place in drug discovery. Avicenna was a Persian physician who is known as the most influential medical writers in the Middle ages. Avicenna’s Canon of Medicine, the most famous books in the history of medicine, presents a clear and organized summary of all the medical knowledge of the time, including a long list of drugs. Several hundred substances and receipts from different sources are mentioned for treatment of different illnesses in this book. The aim of the present study was to provide a descriptive review of all anti-inflammatory and analgesic drugs presented in this comprehensive encyclopedia of medicine. Data for this review were provided by searches of different sections of this book. Long lists of anti-inflammatory and analgesic substances used in the treatment of various diseases are provided. The efficacy of some of these drugs, such as opium, willow oil, curcuma, and garlic, was investigated by modern medicine; pointed to their potent anti-inflammatory and analgesic properties. This review will help further research into the clinical benefits of new drugs for treatment of inflammatory diseases and pain.

Please cite this paper as: Mahdizadeh SH, Khaleghi Ghadiri M, Gorji A. Avicenna's Canon of Medicine: a review of analgesics and anti-inflammatory substances. Avicenna J Phytomed, 2015; 5 (3): 182-202.

Introduction

Abu Ali al-Husain Ebn Abdullah Ebn Sina (980 –1037 AD), known in the West as Avicenna, was a Persian physician who is known as the most influential medical writers in the medieval period. Between the thirteenth to the seventeenth centuries, Avicenna held a high place in Western medical studies, ranking as an acknowledged supremacy. His works had a crucial impact on the modern medicine and at some universities continued to be used for teaching up to the nineteenth century (Brentjes, 1980; Weisser, 2011).
About 100 dissertations were written by Avicenna. Among them, Qanoon-fel-teb (The Canon), originally written in the Arabic, is an immeasurable encyclopedia of medicine that represents all the medical sciences of the time. The Canon was translated into several languages, including Latin, Persian, English, Indian, Chinese, Hebrew, German, and French (Hakim Syed Zillur Rahman, 2004; Weisser, 2011). The Canon, translated first into Latin (Canon medicinae) by Gerard of Cremona, was the main medical textbook in several universities in Europe between 11th to 17th centuries (Moosavi, 2009). Sir William Osler, one of the four founding professors of Johns Hopkins Hospital, noted the Canon as "the most famous medical textbook ever written; a medical bible for a longer time than any other work" (Osler, 1972).

Avicenna (1988) divided the Canon into five books:
1. The first book describes different scope of medicine, the elements, the temperaments, the humors, physiological and anatomical principles, and general therapeutic procedures.
2. The second book explains several plant-, animal-, and mineral-derived drugs, in alphabetical order, with an essay on their properties and side-effects.
3. The third book describes an organ-based classification of the diagnosis and treatment of different diseases.
4. The fourth book defines general medical problems that affect the whole body, such as obesity, poisonous bites, and fever.
5. The fifth book contains numerous compound receipts.

Eight hundred drugs and 650 recipes of different compounds from various sources are listed in the Canon, with extensive comments on the effectiveness of each drug or recipe (Danielle, 2008). Several clinical and experimental studies support the use of some traditional Persian medicines noted by Avicenna in the Canon for the treatment of different diseases. However, most medicinal substances prescribed by Avicenna remain largely unexamined (Gorji, 2003). The anti-inflammatory and analgesic medicaments are a heterogeneous group of substances, which share definite remedial actions and side effects. The search for new pharmacologically active anti-inflammatory and analgesic drugs offered by medieval medical literatures has led to the discovery of some clinically useful drugs. These compounds, during the last two centuries, have played a crucial role as effective remedies of various human diseases as well as in understanding of basic pathophysiology of some diseases (Gorji and Khaleghi Ghadiri, 2001; Gorji and Khaleghi Ghadiri, 2002; Khaleghi Ghadiri and Gorji, 2004; Vakili and Gorji, 2007; Bayan et al., 2013). Despite progress in the development of therapy in recent years, effective and potent anti-inflammatory and analgesic drugs are still required for the treatment of different diseases. The aim of the present study was to provide a descriptive review of all anti-inflammatory and analgesic drugs noted in the Canon of Avicenna. Data for this review were provided by searches of different sections of this book translated in Persian (Avicenna, 1988). It is hoped that this manuscript will help further research into the clinical benefits of these compounds for treatment of inflammatory diseases.

Anti-inflammatory and analgesic drugs

Avicenna (1988) describes the signs and symptoms (pain, swelling, redness, fever, impaired functions, etc.) of different inflammatory diseases (such as pneumonia, rhinitis, otitis, dermatitis, etc.) and their treatment with several substances with different modes of action. These drugs were advised to use as prophylactic or therapeutic. Many of these drugs were prescribed for different inflammatory disease, although some of those were advised for a certain disorder. The strategies for treatment of pain and

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inflammation were divided into the measures of acute and chronic diseases. Furthermore, these drugs were classified for treatment of mild, moderate, or severe conditions in each disorder. It is also noted that some of these drugs in certain conditions act as anti-inflammatory of analgesic drugs, in other condition my provoke pain or inflammation. The anti-inflammatory and analgesic drugs listed in the Canon include plants, animal products, and minerals. Avicenna emphasized the importance of the dose and the route of administration and defined a schedule for drug application. Drugs were also taken via skin, oral, nasal, or rectal routes as well as by inhalation (Table).

Some of the medicaments suggested by Avicenna for treatment of inflammation and pain are well-recognized drugs in modern medicine. Many of these compounds are under experimental or clinical investigations for their probable therapeutic effects. However, most of these drugs remain largely unexamined.

Table. Anti-inflammatory and analgesic substances used in medieval Persia by Avicenna and noted in The Canon. AI (Anti-inflammatory); AG (Analgesic).

| Latin Name                | Common Name | Effect | Administration | Diseases                                      |
|---------------------------|-------------|--------|----------------|-----------------------------------------------|
| Acorus calamus            | Sweet flag  | AG     | Oral Locally   | Sciatica, Headache, Toothache, Pneumopleuritis, Mastitis, Fever |
|                           |             | AI     | Locally        |                                               |
| Acorus calamus            | Sweet flag  | AG     | Oral Locally   | Muscle pain, Sciatica, Colic, Uterine pain, Fever, Pneumonia |
|                           |             | AI     | Locally        |                                               |
| Adiantum capillus-veneris | Maidenhair  | AI     | Locally        | General edema                                 |
| Allium ascalonicum        | Shallot     | AG     | Oral Locally   | Headache, Arthritis, Otitis                   |
|                           |             | AI     | Locally        |                                               |
| Allium sativum            | Garlic      | AG     | Oral Locally   | Acute Inflammation, Chronic and Malignant Wounds, Arthritis and Gout, Sciatica, Common cold, Headache, Earache, Severe Eye Pain, Acute Cough, Lung disease with hematemesis, Gastroenteritis, Liver diseases |
|                           |             | AI     | Locally        |                                               |
| Almond oleum              | Almond oil  | AG     | Locally        | Rhinitis                                      |
|                           |             | AI     |                |                                               |
| Alsidiium Helminthocorton | Corsican    | AG     | Oral Locally   | Intestinal ulcer, Uterine and cervical pain   |
|                           |             |        |                |                                               |
| Althaea officinalis       | Marshmallow | AG     | Locally Oral   | Dermatitis, Arthralgia, Sciatica, Earache, Toothache, Chronic fever |
|                           |             | AI     |                |                                               |


Table 1 continued

| Latin Name       | Common Name | Effect | Administration | Diseases                                    |
|------------------|-------------|--------|----------------|---------------------------------------------|
| Anacyclus pyrethrum | Pellitory   | AG     | Oral Locally   | Dermatitis, Tongue swelling, Headache, Encephalitis, Earache, Toothache |
| Anemon cronaria   | Anemone     | AG     | Oral Locally   | Arthritis, Neuralgia                        |
| Pimpinella anisum| Aniseed     | AG     | Oral Locally   | Enteritis, Orchitis, Sores in nose, Tooth pain |
| Anethum graveolens| Dill        | AG     | Oral Locally   | Chonic skin wounds, Arthritis and Gout      |
| Apium graveolens  | Wild celery | AG     | Locally       | Orchitis, Inflammation of the oral Cavity, Headache |
| Aquilaria malaccensis | Aloes    | AG     | Oral Locally   | Toothache                                   |
| Artemisia absinthium | wormwood | AG     | Oral Locally   | Oritis, Chronic ophthalmitis, Chronic fever |
| Artopa belladona  | Nightshade  | AG     | Locally       | General pain, Gastroenteritis               |
| Asarum europaeum  | Cabaret     | AG     | Oral Locally   | Sciatica, Chronic ophthalmitis, Fever       |
| Asparagus officinalis | Asparagus | AG     | Oral Locally   | Abdominal pain                              |
| Asphodelus ramosus| Asphodel    | AG     | Locally       | Dermatitis, Purulent otitis, Gastritis      |
| Avenae fatua      | Oat         | AI     | Oral Locally   | Scalp inflammation, Eczema, Earache, Cough, Chest pain, Toothache |
| Bambagia          | Cotton plant| AG     | Oral Locally   | Earache, Sore Throat, Cough, Toothache      |
| Berberis vulgaris | Burberry    | AI     | Locally       | Arthritis                                   |
| Boswellia serrata | Frankincense| AI     | Oral Locally   | Scalp inflammation, Arthritis, Gout         |
| Brassica oleracea | Cabbage     | AI     | Oral Locally   | Dermatitis such as herpes, Toothache, Cough, Bronchitis and shortness of Breath, Chest infections, Eye pain, Dropsy and edema, Anal fissure |
| Latin Name          | Common Name | Effect | Administration | Diseases                                      |
|---------------------|-------------|--------|----------------|-----------------------------------------------|
| *Brassica Spp.*     | Mustard     | AG     | Locally        | Joint and muscle pain                         |
| *Cannabis Sativa*   | Hemp        | AI     | Locally        | Ophthalmitis, General edema                    |
|                     |             |        |                | Infectious wounds                             |
|                     |             |        |                | Gout                                          |
|                     |             |        |                | Uterine pain                                  |
| *Carthamus Tinctorius* | Safflower   | AG     | Oral           | Muscle pain                                   |
|                     |             |        | Locally        | Headache                                      |
|                     |             |        |                | Toothache and dental caries                   |
|                     |             |        |                | Chronic earache                               |
|                     |             |        |                | Chronic cough and bronchitis                  |
|                     |             |        |                | Purulent wounds                               |
| *Carum carvi*       | Caraway     | AI     | Oral           | Edema                                         |
|                     |             |        | Locally        | Arthralgia                                    |
|                     |             |        |                | Muscle discomfort                             |
|                     |             |        |                | Arthralgia                                    |
|                     |             |        |                | Scalp inflammation                            |
| *Cheese*            | -           | AG     | Oral           | Pleuritis                                     |
|                     |             |        | Locally        | Gastrointestinal discomfort                   |
| *Cassia fistula*    | Golden shower | AI     | Oral           | General edema                                 |
|                     |             |        | Locally        | Earache                                       |
|                     |             |        |                | Scalp inflammation                            |
|                     |             |        |                | Joint and bone pain                           |
|                     |             |        |                | Eye wounds                                    |
|                     |             |        |                | Gastritis                                     |
| *Castor oleum*      | Castor oil  | AI     | Oral           | Scalp inflammation                            |
|                     |             |        | Locally        | Chronic headache                              |
| *Centaurea cyanus*  | Cornflo-wer | AI     | Oral           | Colic                                         |
| *Chrysanthenum parthenium* | Feverfew  | AG     | Locally        | Sciatica                                      |
| *Cicer arietinum*   | Chana       | AI     | Locally        | Eye swelling                                  |
|                     |             |        |                | Hoarseness                                    |
|                     |             |        |                | Bronchitis and cough                          |
|                     |             |        |                | Stomach pain and gastric ulcer                |
|                     |             |        |                | Uterine pain and infection                    |
|                     |             |        |                | Intestinal ulcer                              |
|                     |             |        |                | Gastritis                                     |
|                     |             |        |                | Headaches                                     |
|                     |             |        |                | Earache                                       |
|                     |             |        |                | Eye swelling                                  |
|                     |             |        |                | Intestinal ulcer                              |
| *Cichorium intybus* | Chicory     | AI     | Oral           | Gum disease                                   |
|                     |             |        | Locally        | Gastritis                                     |
|                     |             |        |                | Headaches                                     |
|                     |             |        |                | Earache                                       |
|                     |             |        |                | Eye swelling                                  |
|                     |             |        |                | Intestinal ulcer                              |
| *Cicuta maculata*   | Hemlock     | AI     | Oral           | Malignant and purulent Wounds                 |
|                     |             |        | Locally        | Rhinitis                                      |
|                     |             |        |                | Chronic headache                              |
|                     |             |        |                | Toothache                                     |
|                     |             |        |                | Ophthalmitis                                  |
Table 1 continued

| Latin Name               | Common Name | Effect | Administration | Diseases                                      |
|--------------------------|-------------|--------|----------------|-----------------------------------------------|
| Cocos nucifera           | Coconut     | AI     | Oral           | Neck pain                                    |
|                          |             | AG     | Locally        | Gastrointestinal ulcer                       |
|                          |             |        |                | Uterine and gum discomfort                    |
| Colchicum autumnale      | Meadow saffron | AI     | Oral           | Purulent dermatitis                          |
|                          |             | AG     | Locally        | Burn                                         |
|                          |             |        |                | Chronic wounds                               |
|                          |             |        |                | Sciatica                                     |
|                          |             |        |                | Arthralgia                                   |
|                          |             |        |                | Toothache                                    |
|                          |             |        |                | Headache                                     |
| Commiphora myrrha        | Myrrh       | AI     | Locally        | Arthralgia                                   |
|                          |             | AG     |                |                                              |
| Commiphora gileadensis   | Balsam of mecca | AI     | Oral           | Pleuritis                                    |
|                          |             | AG     | Locally        | Headache                                     |
|                          |             |        |                | Gastritis                                    |
|                          |             |        |                | Bronchitis                                   |
|                          |             |        | Inhalation     | Kidney pain                                  |
|                          |             |        |                | Hemorrhoid                                   |
| Convolvulus scammonia    | scammony    | AI     | Oral           | Gastroenteritis                               |
|                          |             | AG     |                |                                              |
| Coriandrum sativum       | Coriander   | AI     | Oral           | Muscle weakness                              |
|                          |             | AG     | Locally        | Arthralgia                                   |
|                          |             |        |                | Headache                                     |
|                          |             |        |                | Purulent otitis                              |
|                          |             |        |                | Bleeding gums and gingivitis                 |
|                          |             |        |                | Gastroenteritis                              |
|                          |             |        |                | Hemorrhoid                                   |
| Corylus aveilana         | Common hazel | AI     | Oral           | General edema                                |
|                          |             | AG     | Locally        | Herpes                                       |
|                          |             |        |                | Accidental injuries                          |
|                          |             |        |                | Muscle pain                                  |
|                          |             |        |                | Hiccups                                      |
|                          |             |        |                | Gastritis                                    |
|                          |             |        |                | Chronic fever                                |
| Crocus sativus           | Saffron     | AI     | Oral           | Acute edema and abscess                      |
|                          |             | AG     | Locally        | Bone fractures                               |
|                          |             |        |                | Joint and tendon pain                        |
|                          |             |        |                | Headache                                     |
|                          |             |        |                | Oral diseases                                |
|                          |             |        |                | Diphtheria                                   |
| Cucurbita pepo           | Pumpkin     | AI     | Oral           | Genitourinary pain                           |
|                          |             | AG     |                |                                              |
| Cupressus sempervirens   | pencil pine | AI     | Locally        | Chronic wounds                               |
|                          |             | AG     |                | Arthralgia                                   |
|                          |             |        |                | Gout                                         |
| Curcuma longa            | Curcuma     | AI     | Oral           | Dermatitis                                   |
|                          |             | AG     | Locally        | Pain in the mouth and gum                    |
|                          |             |        |                | Scalp wounds                                 |
| Cyclamen coum            | Sowbread    | AG     | Locally        | Chronic toothache                            |
| Cymbopagon schoenanus    | Sweet rush  | AI     | Oral           | Muscle pain                                  |
|                          |             | AG     | Locally        | Metritis                                     |
|                          |             |        |                | Cervicitis                                   |
|                          |             |        |                | Headache                                     |
| Cynara cardunculus       | Artichoke   | AI     | Oral           | Colic                                        |
|                          |             | AG     | Locally        | Sciatica                                     |
|                          |             |        | Inhalation     | Arthralgia                                   |
|                          |             |        |                | Bronchitis                                   |
Table 1 continued

| Latin Name                  | Common Name   | Effect | Administration | Diseases                                      |
|-----------------------------|---------------|--------|----------------|-----------------------------------------------|
| Dausus carota               | Carrot        | AG     | Oral Locally   | Kidney and uterine pain Fever                 |
| Elettaria cardamomum        | Cardamom      | AI     | Oral Locally   | Sciatica                                      |
| Chees Ferment               | -             | AI     | Oral Locally   | Otitis                                        |
|                            |               | AG     |                | Cystitis                                      |
|                            |               |        |                | Gastritis                                     |
|                            |               |        |                | Colic                                         |
|                            |               |        |                | Fissure anal                                  |
| Faba vulgaris               | Broad bean    | AG     | Oral Locally   | Diphtheria                                    |
|                            |               |        |                | Ophthalmitis                                  |
|                            |               |        |                | Otitis                                        |
|                            |               |        |                | Abscess                                       |
|                            |               |        |                | Gastrointestinal pain                         |
|                            |               |        |                | Arthritis                                     |
| Ferula assafoetida         | Stinking gum  | AI     | Oral          | Fever                                         |
| Ferula gumosa              | Galbanum      | AI     | Oral Locally   | Headache                                      |
|                            |               | AG     |                | Gastroenteritis                               |
| Ficus carica               | Comm-on fig tree | AI   | Oral          | Malignant and purulent Wounds Stomatitis      |
|                            |               | AG     |                | Tooth Pain                                    |
|                            |               |        |                | Gastroenteritis                               |
| Foeniculum vulgare         | Fennel        | AI     | Oral          | Stomatitis                                    |
|                            |               | AG     |                | Otitis                                        |
|                            |               |        |                | Gastritis                                     |
| Flores acacia              | Acacia        | AI     | Oral Locally  | Arthritis                                     |
|                            |               | AG     |                | Chronic eye disease                           |
| Fraxinus excelsior         | Ash tree      | AI     | Locally       | Gout                                          |
|                            |               | AG     |                | Arthritis                                     |
|                            |               |        |                | Earache                                       |
| Fumaria perriflora         | Fineleaf fumitory | AG  | Locally       | Back pain                                     |
|                            |               |        |                | Toothache                                     |
|                            |               |        |                | Gingivitis                                    |
| Gentiana lutea             | Gentian       | AI     | Locally       | Abdominal pain                                |
| Glycyrrhiza glabra         | Liquorice     | AI     | Oral Locally  | Skin wounds                                   |
|                            |               | AG     |                | Scabies                                       |
|                            |               |        |                | Arthralgia                                    |
|                            |               |        |                | Back pain                                     |
|                            |               |        |                | Chronic headache                              |
| Hedera helix               | Ivy           | AI     | Oral Locally  | Skin infections                               |
|                            |               | AG     |                | Earache                                       |
|                            |               |        |                | Scalp inflammation                            |
| Helleborus niger           | Christmas rose | AI   | Locally       | Tonsillitis                                   |
|                            |               | AG     |                | Arthritis                                     |
|                            |               |        |                | Gout                                          |
|                            |               |        |                | Liver pain                                    |
## Table 1 continued

| Latin Name          | Common Name   | Effect | Administration | Diseases                                      |
|---------------------|---------------|--------|----------------|-----------------------------------------------|
| *Hordeum vulgare*   | Barley        | AI     | Oral           | Fever                                         |
| *Hyssopus officinalis* | Hyssop       | AG     | Locally        | Eye swelling, Otitis, Uterine diseases         |
| *Illicium verum*    | Anise         | AI     | Oral           | Dizziness                                     |
|                     |               | AG     | Locally        | Otitis, Headache, Chronic ophthalmitis, Chronic fever |
| *Iris florentina*   | Iris          | AI     | Oral           | Toothache                                     |
|                     |               | AG     | Locally        | Joint contortion                              |
| *Jasminum officinale* | White jasmin | AI     | Locally        | Painful skin disease, Acute mastitis (in pregnancy) Earache Ophthalmitis Eye tumor Uterine pain Gastroenteritis Painful sores in the anal area |
| *Juglans regia*     | Walnut        | AG     | Oral           | Cervical pain, General pain                   |
| *Lactuca sativa*    | Lettuce       | AI     | Oral           | General edema, Joint complaints and gout Sciatica Stomatitis Uterine pain |
| *Lantago psyllium*  | Flea wort     | AI     | Locally        | Gingivitis                                    |
| *Laureo oleum*      | Laurel oil    | AI     | Locally        | Joint diseases and gout Ophthalmitis Neck pain Sore throat |
| *Lavendula stoechas* | Spanish lavende | AI  | Locally        | Arthritis, Anal fissure                        |
| *Lawsonia intermis* | Henna         | AI     | Oral           | Abscess, Purulent scalp inflammation, Purulent rashes Sciatica Bronchitis |
| *Leidium sativum*   | Garden cress  | AI     | Oral           | Gastrointestinal infections, Osteitis, Purulent otitis, Toothache, Intestinal ulcer, Hemorrhoids |
| *Lens culinaris*    | Lentil        | AI     | Oral           | Intestinal pain                              |
| *Lignum vite*       | Grape Tree    | AI     | Oral           | Earache                                      |
|                     |               | AG     | Locally        | Headache                                     |
| *Lilium candidum*   | Iris          | AI     | Oral           | Eye infections, Sore throat, Pyelonephritis, Cystitis, Chronic fever |
|                     |               | AG     | Locally        |                                             |
| Latin Name                | Common Name | Effect | Administration | Diseases                                                                 |
|--------------------------|-------------|--------|----------------|--------------------------------------------------------------------------|
| *Malus orientalis*       | Apple       | AI     | Oral           | Acute general edema, Muscle pain, Abscess, Otitis, General pain, Malignant purulent wounds, Toothache, Chronic cough and pneumonia, Abdominal pain, Gastroenteritis |
|                          |             | AG     | Locally        |                                                                          |
| *Marrubium vulgare*      | Marrubium   | AG     | Oral           | Sciatica, Arthritis, Gout, Otitis, Mouth wound, Gastroenteritis, Colic   |
|                          |             |        | Locally        |                                                                          |
| *Matricaria Spp*         | Camomile    | AI     | Oral           | Toothache, Muscle tightness                                              |
|                          |             | AG     | Locally        |                                                                          |
| *Melilotus officinalis*  | Field melilot | AI   | Oral           | Otitis, Headache, Eye swelling                                           |
|                          |             | AG     | Locally        |                                                                          |
| *Mentha piperata*        | Pepper mint | AI     | Locally        | Purulent skin wounds, Pneumonia, Mastitis                                |
|                          |             | AG     | Oral           |                                                                          |
| *Mentha pulegium*        | Penny royal | AI     | Oral           | Arthralgia, Purulent, Malignant sore                                     |
|                          |             | AG     | Locally        |                                                                          |
| *Morus alba*             | White mulberry | AI   | Oral           | Abscesses and rash, Herpes, Purulent dermatitis, Sciatica, Malignant sore, Toothache, Sore throat, Chest pain, Chronic cough |
|                          |             | AG     | Locally        |                                                                          |
| *Myristica fragrans*     | Nutmeg      | AI     | Oral           | Arthritis, Epilepsy, Gout, Headache, Toothache, Cystitis, Gastrointestinal pain, Cerebrale, Kidney pain, Arthralgia |
|                          |             |        | Locally        |                                                                          |
| *Myrtus communis*        | Myrtle      | AI     | Oral           | Testitis, Headache, Arthritis, Otitis, Chronic eye disease, Gingivitis, Cystitis, Urinary tract infection, Hemorrhiod |
|                          |             | AG     | Locally        |                                                                          |
|                          |             |        | Inhalation     |                                                                          |
| *Narcissus pseudonarcissus* | Lent lily    | AI     | Oral           | Headache, Hardness tongue, Earache, Mastitis                            |
|                          |             | AG     | Locally        |                                                                          |
### Analgesics and anti-inflammatory drugs in the Canon

#### Table 1 continued

| Latin Name            | Common Name | Effect | Administration | Diseases                                      |
|-----------------------|-------------|--------|----------------|-----------------------------------------------|
| Nerium oleander       | Rosebay     | AI     | Oral           | Acute inflammatory                            |
|                       |             |        | Locally        | Cervical pain                                 |
| Nigella sativa        | Black cumin | AI     | Oral           | Arthralgia                                    |
|                       |             | AG     | Locally        | Earache                                       |
|                       |             |        |                | Abdominal pain                                |
|                       |             |        |                | Hemorrhoids                                   |
|                       |             |        |                | Anal fissures                                 |
|                       |             |        |                | Sores in the genital area                     |
| Ocimum basilicum      | Basil       | AI     | Oral           | Kidney-bladder pain                           |
|                       |             | AG     | Locally        | Abscess                                       |
|                       |             |        |                | Headache                                      |
|                       |             |        |                | Toothache                                     |
|                       |             |        |                | Gastritis                                     |
|                       |             |        |                | Hepatitis                                     |
|                       |             |        |                | Menstrual pain                                |
|                       |             |        |                | Uterine pain                                  |
|                       |             |        |                | Arthralgia                                    |
|                       |             |        |                | Intestinal ulcer                              |
|                       |             |        |                | Ophthalmitis                                  |
| Olea europaea         | Olive       | AI     | Locally        | Gout                                          |
|                       |             | AG     |                | Acute ophthalmitis                            |
|                       |             |        |                | Chronic swelling of the diaphragm             |
|                       |             |        |                | Liver disease                                 |
|                       |             |        |                | Uterine pain                                  |
|                       |             |        |                | Kidney pain                                   |
| Oleum lilia           | Lilies oil  | AI     | Locally        | Earache                                       |
|                       |             |        |                | Headache                                      |
|                       |             |        |                | Tinnitus                                      |
|                       |             |        |                | Kidney pain                                   |
|                       |             |        |                | Bladder pain                                  |
|                       |             |        |                | Uterine discomfort                            |
| Onosma echioides      | Hairy onosam| AG     | Oral           | Stomachache                                   |
|                       |             |        | Locally        | Lumbar pain                                   |
|                       |             |        |                | Liver pain                                    |
| Opoponax gummi        | Opopana-ax Gum| AG | Locally | Pain                                          |
|                       |             |        |                | Sciatic pain                                  |
| Orchis maculata       | Spotted orchis| AG | Oral         | Skin diseases                                 |
|                       |             |        | Locally        | Herpes                                        |
|                       |             |        |                | Skin induration                               |
|                       |             |        |                | Corns                                         |
|                       |             |        |                | Arthritis                                     |
|                       |             |        |                | Tinnitus and hearing loss                     |
|                       |             |        |                | Headaches                                     |
|                       |             |        |                | Eye diseases                                   |
|                       |             |        |                | Cystitis                                      |
|                       |             |        |                | Gastroenteritis                               |
| Origanum majorana     | Marjoram    | AI     | Oral           | Dermatitis                                    |
|                       |             | AG     | Locally        | Headaches                                     |
|                       |             |        |                | Ophthalmitis                                  |
|                       |             |        |                | Lung diseases such as bronchitis and chronic cough |
|                       |             |        |                | Uterine pain                                  |
|                       |             |        |                | Chronic fever                                 |
|                       |             |        |                | Toothache                                     |
|                       |             |        |                | Gingivitis                                    |
|                       |             |        |                | Otitis                                        |
Table 1 continued

| Latin Name          | Common Name         | Effect | Administration | Diseases                      |
|---------------------|---------------------|--------|----------------|-------------------------------|
| *Origanum vulgare*  | Wild marjoram       | AI     | Oral           | Toothache                     |
|                     |                     | AG     | Locally        | Swelling of the spleen        |
| *Oxalis crenata*    | Sorrel              | AI     | Oral           | Arthralgia                    |
|                     |                     | AG     | Locally        | Purulent lung diseases        |
|                     |                     |        |                | Blood spitting and coughing   |
| *Paeonia officinalis*| Common peony        | AI     | Oral           | Toothache                     |
|                     |                     | AG     | Locally        | Flatulence                    |
|                     |                     |        |                | Abdominal pain and fever      |
| *Papaver somniferum*| Opium poppy         | AI     | Oral           | Arthralgia                    |
|                     |                     | AG     | Locally        | Sciatica                      |
|                     |                     |        |                | Gout                          |
|                     |                     |        |                | Muscle pain and nerve injury  |
|                     |                     |        |                | Otitis                        |
|                     |                     |        |                | Blepharitis                    |
|                     |                     |        |                | Urogenital pain               |
|                     |                     |        |                | Abdominal pain                |
|                     |                     |        |                | Uterine pain                   |
|                     |                     |        |                | Colic                         |
|                     |                     |        |                | Postoperative pain            |
|                     |                     |        |                | Chronic pain                  |
| *Papaver rosolaccio*| Red poppy           | AI     | Locally        | Dermatitis                    |
|                     |                     | AG     |                | Earache                       |
|                     |                     |        |                | Eye pain                       |
|                     |                     |        |                | Uterine pain                   |
|                     |                     |        |                | Orchitis                       |
| *Parmes cardus*     | Thistle             | AI     | Oral           | Chronic uterine/cervical pain |
|                     |                     | AG     |                |                               |
| *Pastinaca sativa*  | Pastinace           | AI     | Oral           | Headache                      |
|                     |                     | AG     | Locally        | Stomatitis                    |
|                     |                     |        |                | Ophthalmitis                  |
|                     |                     |        |                | Dermatitis                    |
|                     |                     |        |                | Fever                         |
| *Phonix dactylifera*| Date                | AI     | Locally        | Ophthalmitis                  |
|                     |                     | AG     |                | Toothache                      |
| *Pinus grana*       | Pine seeds          | AI     | Oral           | Abscess                       |
|                     |                     | AG     | Locally        | Dental caries                  |
|                     |                     |        |                | Toothache                      |
|                     |                     |        |                | Spleen diseases                |
|                     |                     |        |                | Uterine disorders              |
| *Pinus nucens*      | Pine cone           | AG     | Locally        | Back muscles vertebrae pain   |
| *Pinus silvestris*  | Pine                | AG     | Oral           | Arthralgia                    |
|                     |                     |        |                | Nerve pain                    |
|                     |                     |        |                | Back pain                      |
|                     |                     |        |                | Muscle complaints              |
|                     |                     |        |                | Abdominal pain and colic      |
| *Pinus silvestris*  | Scots pine          | AI     | Oral           | Pleuritis                      |
|                     |                     | AG     | Locally        | Hepatitis                      |
|                     |                     |        |                | Splenitis                      |
|                     |                     |        |                | Gastroenteric complaint        |
|                     |                     |        |                | Joint and bone pain            |
|                     |                     |        |                | Ophthalmitis                   |
| Latin Name            | Common Name         | Effect | Administration | Diseases                                      |
|----------------------|---------------------|--------|----------------|-----------------------------------------------|
| Piper nigrum         | Black pepper        | AI     | Oral           | Chronic earache                              |
|                      |                     | AG     | Locally        |                                               |
| Pistacia vera        | Pistachio           | AG     | Oral           | Dermatitis                                    |
|                      |                     |        | Locally        | Eliminates the fever                         |
| Plantago major       | Way-bread           | AI     | Locally        | Bone fracture                                 |
|                      |                     | AG     |                | Gout                                          |
|                      |                     |        |                | Arthralgia                                    |
| Platanus orientale   | Oriental plane      | AI     | Locally        | Knee pain                                     |
|                      |                     | AG     |                | Back pain                                     |
|                      |                     |        |                | Toothache                                     |
|                      |                     |        |                | General hard edema                            |
| Polygonum amphibium  | Water knotweed      | AI     | Locally        | Lumbar pain                                   |
|                      |                     | AG     |                |                                               |
| Polypodium vulgare   | Adders-fern         | AI     | Oral           | Tonsillitis                                   |
|                      |                     | AG     | Locally        | Otitis                                        |
|                      |                     |        |                | Arthritis                                     |
|                      |                     |        |                | Ophthalmitis                                  |
|                      |                     |        |                | Mastitis                                      |
|                      |                     |        |                | Chronic cough                                 |
| Populisferve         | Poplar              | AI     | Oral           | Headache                                      |
|                      |                     | AG     | Locally        |                                               |
| Portulaca oleracea   | Common purslane     | AI     | Oral           | Headache                                      |
|                      |                     | AG     | Locally        | Arthritis                                     |
|                      |                     |        |                | Testitis                                      |
| Prunus domestica     | Plum                | AI     | Oral           | Spleen pain                                   |
|                      |                     | AG     |                | General inflammation                          |
| Pterocarpus santalinus| Sandal wood       | AI     | Locally        | Tooth pain                                    |
|                      |                     | AG     |                | Chronic cough                                 |
|                      |                     |        |                | Liver pain                                    |
| Punica granatum      | Pomegranate         | AG     | Oral           | Gastroenteritis (particularly in children)    |
|                      |                     |        |                | Cervical discomfort                           |
|                      |                     |        |                | Arthralgia                                    |
|                      |                     |        |                | Back pain                                     |
|                      |                     |        |                | Headaches                                     |
|                      |                     |        |                | Earache                                       |
|                      |                     |        |                | Colic                                         |
|                      |                     |        |                | Dermatitis                                    |
|                      |                     |        |                | Ophthalmitis                                  |
|                      |                     |        |                | Ocular diseases                                |
| Raphanus sativus     | Radish              | AI     | Oral           | Hepatitis                                     |
|                      |                     | AG     |                |                                               |
| Recinus              | Castrol oil         | AI     | Locally        | General edema                                 |
|                      |                     |        |                | Purulent skin wounds                          |
|                      |                     |        |                | Impetigo                                      |
| Rhabarber rhaponticum| Rheum               | AI     | Oral           | Gastritis                                     |
|                      |                     | AG     | Locally        | Gonorrhea                                     |
|                      |                     |        |                | Chronic fever                                 |
| Rhus coriaria        | Sicilian sumac      | AI     | Oral           | Gastritis                                     |
|                      |                     | AG     |                | Spleen pain                                   |
|                      |                     |        |                | Metritis                                      |
|                      |                     |        |                | Kidney pain                                   |
| Latin Name               | Common Name   | Effect | Administration | Diseases                                      |
|-------------------------|---------------|--------|----------------|-----------------------------------------------|
| **Rosa gallica**        | Red rose      | AI     | Oral           | Edema                                        |
|                         |               | AG     |                | Toothache                                    |
|                         |               |        |                | Earache                                      |
|                         |               |        |                | Breast disease                               |
|                         |               |        |                | Bronchitis                                   |
|                         |               |        |                | Cough                                        |
| **Rosam**               | Rose oil      | AI     | Locally        | Sciatica and back pain                       |
|                         |               | AG     |                | Toothache                                    |
|                         |               |        |                | Headache                                     |
| **Rubus sectio**        | Bramble       | AI     | Oral          | Arthritis                                    |
|                         |               |        | Locally       | Gout                                         |
|                         |               |        |                | Acute opthalmritis                           |
|                         |               |        |                | Mastitis                                      |
|                         |               |        |                | Colitis                                       |
| **Saccharum officinalis** | Sugar cane   | AI     | Oral          | Gastritis                                    |
|                         |               | AG     | Locally       | Hepatitis                                    |
|                         |               |        |                | Metritis                                      |
| **Salix**               | Willow        | AI     | Oral          | Osteitis                                     |
|                         |               | AG     | Locally       | Headache                                     |
|                         |               |        |                | Ophthalmitis                                 |
|                         |               |        |                | Orbital Injury                               |
|                         |               |        |                | Liver disorders and jaundice                 |
|                         |               |        |                | Dysmenorrhea                                 |
| **Seasam indicum**      | Sesame        | AG     | Locally       | Chronic ocular disease                       |
|                         |               |        |                | Earache                                      |
|                         |               |        |                | Hemorrhoid                                   |
| **Semecarpod oriente**  | Marsh nut     | AI     | Locally       | Colic                                        |
|                         |               | AG     |                | Arthralgia                                   |
| **Sesamum indicum**     | Sesame        | AI     | Oral          | Chronic and malignant sore                   |
|                         |               | AG     | Locally       | Burn                                         |
|                         |               |        |                | Toothache                                    |
|                         |               |        |                | Earache                                      |
|                         |               |        |                | Mastitis                                      |
| **Styrax officinalis**  | Styrax tree   | AI     | Oral          | Malignant tumors                             |
|                         |               | AG     | Locally       | Acute earache                                |
|                         |               |        |                | Toothache                                    |
|                         |               |        |                | Rash                                         |
|                         |               |        |                | Ophthalmitis                                 |
|                         |               |        |                | Bronchitis                                   |
|                         |               |        |                | Kidney and bladder pain                      |
|                         |               |        |                | Intestinal ulcer                             |
|                         |               |        |                | Hemorrhoids                                  |
|                         |               |        |                | Fever                                        |
| **Sulfur**              | Sulfur        | AI     | Oral          | Orchitis                                     |
|                         |               | AG     | Locally       | Ophthalmitis                                 |
|                         |               |        |                | Colic                                        |
| **Tamarindus indica**   | Tamarind      | AI     | Oral          | Dermatitis                                   |
|                         |               |        | Locally       | Acute wounds stomach pain                   |
|                         |               |        |                | Gastroenteritis                              |
| **Tamarix gallica**     | Tamarisk      | AG     | Locally       | Acute edema                                  |
|                         |               |        |                | Headaches with fever                         |
|                         |               |        |                | Stomatitis                                   |
| **Taraxacum officinale**| Dandelion     | AI     | Locally       | Abscess                                      |
|                         |               | AG     |                | Arthralgia                                   |
|                         |               |        |                | Deep wound                                   |
|                         |               |        |                | Bone wound                                   |
|                         |               |        |                | Dermatitis                                   |
|                         |               |        |                | Headache                                     |
|                         |               |        |                | Purulent ear infections                      |
|                         |               |        |                | Injury of the orbits                         |
Analgesics and anti-inflammatory drugs in the Canon

Continued table 1.

| Latin Name         | Common Name | Effect | Administration | Diseases                                      |
|--------------------|-------------|--------|----------------|-----------------------------------------------|
| Taxus baccate      | Yew tree    | AI     | Oral           | Sciatic pain, Arthritis and gout, Dental pain and dental caries, Headaches, Ear Diseases, Gum bleeding and gingivitis |
| Tragopogon pratensis | Meadow salsify | AI   | Locally       | Wounds and nerve damage, Muscles, Gastroenteritis |
| Trigonella foenum-graecum | Alhova      | AI     | Oral           | Sciatic pain, Arthralgia                       |
| Tropaeolum majus   | Monks cress | AI     | Oral           | Sore throat, Arthralgia                        |
| Urtica dioica      | Nettle      | AI     | Oral           | Gout, Headache, Otitis, Ophthalmitis, Diarrhea, Colic, Chronic pain |
| Valeriana officinalis | Valerian    | AI     | Oral           | Headache, Inflammation of the penis, Ophthalmitis |
| Verbascum thapsiforme | Mullein    | AI     | Locally       | Rhinitis, Sinusitis, Otitis, Orchitis, Ophthalmitis |
| Vicia sativa       | Tare        | AG     | Locally       | Burn, Arthralgia, Headache, Uterine pain       |
| Vinegar            | -           | AG     | Oral           | Herpes, Purulent skin wounds, Gout, Headache, Gingivitis |
| Viola odorata      | Sweet violet| AI     | Locally       | Headache, Cold                                 |
| Vitex agnus-castus | Chasteberry | AG     | Oral           | Pain, Colic                                  |
| Vitis vinifera     | Grape vine  | AG     | Oral           | Gasteritis, Uterine pain, Abdominal pain, Kidney and bladder pain |
| Zingiber officinale | Ginger      | AI     | Oral           | Headache, General pain                        |

Well recognized anti-inflammatory and analgesic drugs

*Papaver somniferum*

Opium (*Papaver somniferum*) was advised for treatment of arthralgia, sciatica, gout, muscle pain and nerve injury, otitis, blepharitis, urogenital pain, abdominal pain, uterine pain, colic, postoperative pain, and chronic pain in the Canon. In 1680, Sydenham was noted...
opium: "Among the remedies which it has pleased Almighty God to give to man to relieve his sufferings, none is so universal and so efficacious as opium" (Yaksh and Wallace, 2011).

Administration of opiate in Europe increased rapidly in the 18th century (Miller and Tran, 2000). Opium and its derivatives have been used as the most widely analgesics for severe pain since the early 1800s (Hamilton and Baskett, 2000). Nowadays, application of several opioids is considered effective for the treatment of various forms of headaches (Gorji and Khaleghi Ghadiri 2001), postoperative pain (Hamilton and Baskett, 2000), neuropathic pain (Berrios et al., 2008), and different chronic pain syndromes (Vallejo et al., 2011). Opium also plays a crucial role in our understanding of basic mechanism of pain (Lipman, 1990).

**Salix spp.**

In the Canon, administration of willow oil (*Salix spp.*) was recommended for treatment of headache, osteitis, ophthalmitis, orbital injury, liver disorders and jaundice, and dysmenorrhea. In the first half of the 19th century salicin, the principal active constituent of willow oil was extracted from the willow bark and later salicylic acid was obtained. Today, the synthetically produced preparations of salicylic acid are well-known analgesic, anti-inflammatory and antipyretic drug (Amann and Peskar, 2002).

Acetylsalicylic acid is recommended as an analgesic and prophylactic in different types of headaches [4], and alleviates dysmenorrhea (Pendergrass et al., 1985). Furthermore, it has been suggested that regular aspirin use (more than 15 times per month) may be associated with a lower prevalence of non-alcoholic fatty liver disease among men and older patients (Shen et al., 2014).

**Curcuma longa**

Curcuma (*Curcuma longa*) is advised for treatment of different inflammatory diseases and pain in the Canon. Promising effects of curcuma have been reported in patients with various pro-inflammatory diseases, including oncologic disorders, cardiovascular disease, rheumatologic diseases, chronic anterior uveitis, gastrointestinal inflammatory diseases (Crohn's disease, ulcerative proctitis and colitis, irritable bowel disease, pancreatitis, gastric inflammation as well as ulcer, and cholecystitis), lupus nephritis, ischemic brain injuries, and acquired immunodeficiency syndrome (Gupta et al., 2013; Tamaddonfard, 2013; Arshami et al., 2013; Ghosh et al., 2014).

**Cannabis sativa**

Cannabis (*Cannabis sativa*) was prescribed for the alleviation of severe headache as well as treatment for degenerative bone and joint diseases, ophthalmitis, general edema, infectious wounds, gout, and uterine pain. The major active component of cannabis, tetrahydrocannabinols, in addition to other constituents of cannabis has been shown to possess anti-nociceptive properties (Wilson and Nicoll, 2002).

Cannabinoids alleviate pain by the activation of a brainstem circuit that is required for opioid-mediated analgesia, and modulate basal nociceptive thresholds through the activation of the rostral ventromedial medulla [8]. It has been suggested that cannabinoids may act as an analgesic in migraine pain by inhibition of spreading depression phenomenon (Kazemi et al., 2012). Different constituents of cannabis have been suggested to be useful in the treatment of intervertebral disc degeneration (Silveira et al., 2014), endometriosis (Sanchez et al., 2012), and breast cancer (Behrend, 2013). Cannabis has been suggested to be used to treat patients with cancer who do not adequately treated with other analgesics and anti-emetics (Nauck et al., 2004).
Allium sativum

Garlic (*Allium sativum*) was recommended by Avicenna in his book for treatment of acute inflammation, chronic and malignant wounds, arthritis and gout, sciatica, common cold, headache, earache, severe eye pain, acute cough, lung disease with hematemesis, gastroenteritis, and liver diseases. Anti-inflammatory effect is a well-known property of this plant. Garlic and its bioactive components protect the hepatocytes from several toxic agents and act as antimicrobial, antifungal, and antiviral substances (Bayan et al., 2014). Diallyl disulfide, a major organosulfur compound in garlic oil, has been shown to be a useful substance in treatment of respiratory inflammation (Shin et al., 2013). Administration of garlic has been suggested for treatment of common cold (Allan and Arroll, 2014), arterial occlusive disease (Jepson et al., 2013), migraine headache (Roussos and Hirsch, 2014; Marschollek et al., 2014), and prevention of different tumors (Bayan et al., 2014).

Medicaments under investigation for their probable anti-inflammatory and analgesic effects

*Matricaria chamomilla*

Avicenna advised to use chamomile (*Matricaria chamomilla*) for treatment of headache, edema, conjunctivitis, jaundice, chronic fever, lithiasis, amenorrhea, toothache, and muscle tightness. Chamomile is recommended to relieve itching and inflammation and facilitate healing of peristomal skin lesions in patients undergone the gastrointestinal or urinary surgeries (Charousaei et al., 2011). The fluid extract from chamomile reduced pain of aphthous ulcers in patients suffering from recurrent aphthous stomatitis (Ramos-e-Silva et al., 2006). It is hypothesized that chamomile flavonoids and polyphenols due to its anti-inflammatory properties via the inhibition of pro-inflammatory biomarkers in macrophages, inhibition of endogenous prostaglandin E2 levels, and reduction of nitric oxide values may alleviate migraine pain (Zargaran et al., 2014). Chamomile modulates phase I and phase II drug metabolizing enzymes in the liver (Maliakal and Wanwimolruk, 2001), improves endometrial tissue arrangements (Farideh et al., 2010), and alleviates pain and edema present in various inflammatory conditions (Tomić et al., 2014) in animal experiments. The anti-inflammatory effect of chamomile is suggested to be mainly due to its essential oils, such as bisabololand, chamazulene, and matricin, possibly via inhibition of histamine release and the production of prostaglandin (Safayhi et al., 1994; Miller et al., 1996; Srivastava et al., 2010).

*Malus orientalis*

Apple (*Malus orientalis*) is advised for treatment of acute general edema, muscle pain, abscess, otitis, purulent wounds, toothache, chronic cough and pneumonia, abdominal pain, and intestinal inflammation as well as for prevention of headache by Avicenna. The apple contains polyphenols with a large variability in their structures, which are stored in vacuoles and chromoplasts (Francini and Sebastiani, 2013). Antioxidant reactions of phytochemicals inhibit the oxidation of harmful substances and act as radical catcher. Reactive oxygen species are noxious in a large amount and cause cell damage by reaction with lipids, proteins and deoxyribonucleic acid (Mladenka et al., 2010). Secondary plant metabolites and polyphenols have anti-inflammatory, anti-carcinogenic, anti-microbial, anti-oxidant, and anti-thrombotic effects (Scalbert et al., 2005; Jelodarian et al., 2013). Apple polysaccharide extract is suggested to prevent colitis-associated colon cancer via the inhibition of TLR4/MD2-mediated signaling and the inhibition of NF-κB-mediated inflammatory signaling pathways (Zhang et al., 2015). Apple flavonols in combination with fish oil inhibited the production of pro-inflammatory mediators and significantly improved blood lipid
profiles in rats with diet-induced hyperlipidemia and lipopolysaccharide-induced acute inflammation (Sekhon-Loodu et al., 2014).

High-flavonoid apple was associated with decreases in the transcription levels of inflammation-linked genes for interleukin-2 receptor, chemokine receptor 2, chemokine ligand 10, and chemokine receptor 10 as well as in production of prostaglandin E2 (Espley et al., 2014).

*Boswellia serrata*

In medieval Persian, frankincense (*Boswellia serrata*) was advised for treatment of abscess, wounds and malignant tumors, skin rashes, dermatitis, nausea and vomiting, gastrointestinal inflammation, and arthritis. Several experimental studies have shown that frankincense possesses anti-inflammatory, analgesic, antimicrobial, hepaotoactive, and anti-proliferative effect (Abdel-Tawab et al., 2011).

The resinous part of *Boswellia serrata* possesses several anti-inflammatory substances, including mono-, di-, tri-, tetra-, and four major pentacyclic triterpenic acids (Siddiqui, 2011). Oral administration of Boswellia serrata gum resin extract significantly reduced the levels of several inflammatory mediators (interleukins 1β and 6, tumor necrosis factor-α, Interferon gamma, and prostaglandin E2), and increased interleukin-10.

The protective effect of frankincense against rheumatoid arthritis is suggested evident due to the decrease in arthritis scoring and bone histology in a collagen induced arthritis model in rats (Umar et al., 2014). Aflapin, a novel Boswellia-derived anti-inflammatory product, significantly inhibited interleukins 1β-induced death of human primary chondrocytes and improves production of glycosaminoglycan in human chondrocytes (Sengupta et al., 2011).

*Cinnamomum camphora*

Camphor (*Cinnamomum camphora*) is advised for treatment of headache and arthralgia as well as against inflammation in different organs. Camphor inhibited heat-sensitive transient receptor potential vanilloid subtype 1 (TRPV1) and several other related channels, which may underlie the analgesic effects of camphor (Xu et al., 2005). Camphor activated cultured primary keratinocytes (contained heat-activated receptors), and this effect was abolished in TRPV3 null mice (Moqrich et al., 2005).

Phytochemical investigation of Myrrh (*Commiphera myrrha*) has resulted in identification of more than 300 secondary metabolites which have exhibited a wide-range of pharmacological properties that are effective in treatment of inflammatory and infection diseases.

The bioactive steroids guggulsterones have been suggested as a potent inhibitory component on tumor cells and inflammation (Shen et al., 2012). Lavender (*Lavendula stoechas*) is believed to have a variety of therapeutic and curative properties in the Canon. In a placebo-controlled clinical trial, inhalation of lavender oil was suggested as an effective and safe treatment in acute management of migraine attacks (Sasannejad et al., 2012). Lavender inhibited some inflammatory processes, such as lipopolysaccharide-induced inflammatory reaction (Koulivand et al., 2013).

Ethanolic and aqueous extracts of saffron (*Crocus sativus*), another analgesic and anti-inflammatory drug mentioned in the Canon, have been suggested as a useful substances in treatment of different kinds of neuropathic pain and acetaminophen toxicity (Amin and Hosseinzaede, 2012; Omidi et al., 2014).

Several strategies have been used for development of new drugs. One of these strategies is the use, development and improvement of existing medicines, like natural healing substances, which have been used long to treat the illnesses in traditional medicine. Although some of
Analgesics and anti-inflammatory drugs in the Canon

anti-inflammatory and analgesic substances advised by Avicenna in the Canon are used by modern medicine, the exact mechanism of their action as well as biochemical and pharmacological values needs more investigations. Several other drugs are still unexamined, which have the potential for further investigations and discovery of new drugs against inflammatory diseases and pain.

Acknowledgment
Authors appreciated financial supports of Iran National Science Foundation (INSF) and Shefa Neuroscience Center (Doctor Thesis 97112).

Conflict of interest
The Authors declare that there is no conflict of interest.

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