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Review Article

A Comparative Evaluation Of Central Nervous System Acting Drugs By Screening Models

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ABSTRACT

Drugs that stimulate or depress CNS play an important role in human therapeutics. Undesirable side effects and ineffectiveness of currently available CNS stimulants or depressants in many situations call for development of novel drugs. This study was designed for screening the activity of drugs for central nervous system. More particularly to compare the efficay of marketed CNS drugs with herbal drugs. CNS stimulant drugs Unicontin, Armodafinil, Bacopa monnieri were choosen and their locomotor activity was screened using Actophotometer. Bacopa monnieri was found to be equally potent to Armodafinil by the end 2hrs with a M±Sem of 142.1±1.01. CNS depressant drugs Clonazepam, Zolpidem and Ashwagandha were selected. The depressant activity was also screened by actophotometer. The results showed Ashwagandha has a potent CNS depressant action upto 2hrs with a M±Sem of 58±1.78 which may be due to its antioxidant action. Hence plant derived drugs can replace the conventional CNS drugs for various ailments.

INTRODUCTION

Stress is a natural occurrence that affects everyone at some point in their lives. (1) When stress becomes excessive it is detrimental to the body. (2) Anxiety is the patient's psychological and physiological state and is marked by cognitive, somatic, emotional, and behavioral factors. (3) A feeling of fear, confusion, or tension stemming from the anticipation of an imagined or unreal treat is referred to as anxiety. The most widely prescribed medication for anxiety is benzodiazepine which are the most common types of compounds used in anxiety. (4) Depression is a widespread psychiatric ailment. (5) Central nevous system depression also known as CNS depression is a neurological depression that causes slowed breathing, slowed heart rate, and loss of consciousness, which may lead to coma and death. Cental nervous system stimulation is the primary action of a diverse group of pharmacological agents and adverse effect associated with the administration of an even larger group of drugs.

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(6) The two classes of drugs that are prominently used to stimulate the CNS are psychomotor stimulation and hallucinogens. (7) Medicinal plant therapies may be effective alternatives in the treatment of depression and anxiety. The rich wealth of plant kingdom can represent a novel source of newer compound with significant therapeutic activites. The most important merits of herbal medicine seem to be their perceived efficacy, low adverse effects, and low cost.(8) Bacopa monniera is a well-identified by common name water Hyssop (Brahmi). This herbal plant is mostly used in the Ayurveda medicinal system, originating from India. (9) Its CNS-stimulating properties are seen through its ability to improve and build mental performance. The plant has ability to enable the body to withstand resistance to physical and emotional stress. Its CNS stimulating properties are seen through its ability to improve and build the mental performance. The plant has both long and short-term improvements in memory. Additionally, it increases the intelligence, longevity, and circulation in the brain. (10) Ashwagandha is commonly known as the, “Indian winter cheer” or “Indian Ginsang” belongs to the family Solanaceae. This herb is a well used in the Indian medicinal system of Ayurveda. It has wide use in treating various kinds of disease processes and more so as a nervine tonic.(11) As a potent antioxidant, it helps protect the body against cellular damage due to free radicals. (12) This study is conducted for screening marketed CNS stimulants and depressants using an actophotometer and to compare their efficacy with natural compounds. (13)

MATERIALS AND METHODS

Drugs and chemicals:

CNS Stimulants:

Unicotin, Armodafinil, Bacopa monnieri.

CNS Depressants:

Clonazepam, Zolpidem, Ahwagandha.

Animals: Healthy adult Swiss albino rats (200 to 250gm) of either sex were used in this study. All the animals were obtained from an institutional animal house. The animals were divided into 7 groups and 3 in each. Animals were kept in cages in standard temperature-regulated rooms with air-conditioning and 12-hour light and dark cycle and had free access to water and a standard laboratory diet. They were allowed to acclimatize to the laboratory conditions and trained to acclimatize to restrainer for 1 week before the experiments were conducted. Food was withdrawn 12 hours before drug administration until the completion of the study. The study was approved by the Institutional Animal Ethics Committee(IAEC), and all the experiments were performed as per the Committee for Control and Supervision of Experiments on Animals (CPCSEA) guidelines. The protocol no. is IAEC/SVCP/2022/03.

Instrument used: Actophotometer

The locomotor activity of rats was monitored using the Actophotometer The Actophotometer (Labtech 17 model) is equipped with six photocells that have infrared bulbs. This equipment is made in a manner that the animal blocks only one beam as it moves around. A Set of seven groups of rats were used and administered the respective study agent and standard drug respectively. The negative control group was administered normal saline while the positive control group was administered the standard CNS stimulant drug(Unicotin)/ CNS depressant drug(Clonazepam). The two experimental groups will be administered the Armodafinil and Bacopa monnieri reconstituted in normal saline. Another two groups received Zolpidem and Ahwagandha. The administration of the drug and extract was done by the oral route. The locomotor activity was evaluated for every 30 minutes till 2hrs and involved placing only one rat in the Actophotometer at a time. Each response was

recorded for three minutes time. On elapse of the cut-off period, the count for each rat for all the groups was recorded.

Statistical analysis: All the values were expressed as the mean ± SEM (Standard Error Mean) of a triplicate experiment (n = 3 per group). The results obtained were analyzed by a one-way ANOVA test.

RESULTS

Groups	0 min	30 mins	60 mins	90 mins	120 mins
Group I Control M±SEM SD	116.6±0.87 1.96	125.3±1.75 3.93	138.5±0.88 1.97	129.3±0.92 2.06	124.6±1.66 3.72
Group II Standard Unicotin M±SEM SD	133.6±0.96 2.16	162.3±1.00 2.25	171±0.48 1.09	183.3±1.34 3.01	152.8±0.99 2.28
Group III Test drug Armodafinil M±SEM SD	112.3±1.00[a] 2.2	124.3±1.22[a] 2.73	144.6±1.25[a] 2.80	154.3±1.29[a] 2.89	145.6±1.38[a] 3.09
Group IV Herbal drug Bacopa monnieri M±SEM SD	133.8±1.753[b] 3.920034	147.1±1.46[b] 2.562551	152.5±1.568[a] 3.507136	158.6±1.514[a] 3.386247	142.1±1.011[a] 2.478479

Table 1: Mean + SEM of CNS stimulant activity on rats using an Actophotometer

Groups	0 min	30 mins	60 mins	90 mins	120 mins
Group I Control M±SEM SD	122.3±1.188 2.65	118.8±0.5439 0.98	108.6±1.222 2.73	97.3±1.222 2.73	86.6±1.566 3.50
Group V Standard Clonazepam M±SEM SD	126.8±0.20 1.83	95.6±1.31 2.94	70±2.52 5.65	40±2.82 6.32	31.3±1.75 3.93
Group VI Test Drug Zolpidem M±SEM SD	124.2±0.69[a] 1.54	107.6±1.87[a] 4.19	85.3±1.69[a] 3.74	59.2±1.73[a] 3.88	43.6±0.8[a] 1.78
Group VII Herbal Drug Ahwagandha M±SEM SD	128.6±0.46[b] 1.03	113.5±0.54[b] 1.22	92.3±2.07[b] 4.63	68.2±1.78[a] 4.0	58.7±1.78[a] 4.0

Table 2. Mean ± SEM of CNS Depressant activity on rats using an Actophotometer

The CNS stimulant and CNS depressant effects of the marketed products are compared with selected herbal drugs by monitoring locomotor activity

using an actophotometer for up to 2 hours at regular intervals of 30 minutes. The animals were divided into 7 groups, of 3 animals each. Group 1 is the control that received normal saline. Group II received the standard CNS stimulant unicotin. Group III received the selected marked CNS stimulant drug armodafinil. Group IV received the herbal CNS stimulant drug Bacopa monnieri. Group V received the standard CNS depressant drug Clonazepam. Group VI received the marketed CNS depressant drug Zolpidem. Group VII received the herbal CNS depressant Ashwagandha. The results obtained from this study indicate, that the control group CNS stimulating activity of the standard drug unicotin i.e. group II shown to increase with time from 30 mins to 90 mins with a mean of 133.6± 0.96 to 183.3±1.34. Marketed CNS stimulants armodafinil has also shown significant stimulant action up to 90min with a mean of 153±1.29. Herbal drugs Bacopa monnieri also showed significant CNS stimulant action up to 90 minutes with a mean 158.6± 1.51. It is found that Bacopa monniera is equally significant with armodafinil and unicotin up to 90 min.

The CNS depressant activity of Clonazepam, Zolpidem, and Ashwagandha was also comparatively screened by an actophotometer. Clonazepam is found to decrease the locomotor activity rate with time from 30 min to 120 min with a mean+SEM 95.6±1.31 at 30mins to 31.3± 1.75 at 120 min. Zolpidam also shows significant depressant action with mean 107.6±1.87 to 43.6± 0.8 at 30min and 120min.Correspondingly the herbal drug Ashwagandha has shown significant anxiolytic action with a mean 113.5± 0.54 to 58.7± 1.78 at 30 min and 120 min respectively. The results are shown in table 1& 2.

Discussion: Continuous exposure to stress and stressful life events is a known risk factor for developing many psychological disorders such as anxiety, depression, cognitive impairment, etc. Many agents can execute the function of the CNS by inhibiting calmness and sedation. The results obtained for the study indicate armodafinil, a conventional CNS stimulant, and Bacopa are equally potent in increasing the time taken by each rat and the high counts observed by the actophotometer. However Unicotin a standard CNS stimulant increases locomotor activity more as compared with Bacopa monnieri.

At present, available anxiolytic drugs provide symptomatic improvement in patients with anxiety. These drugs also have adverse effects such as sedation, and headache. In this study, the results revealed that Ashwagandha has effects on stress, mood, and insomnia. Its action will be usefull in stress-induced anxiety may be due to antioxidant properties.

Therefore as a solution for stress-induced CNS depression or anxiety symptomatic relief is only achieved by conventional drugs rather than targeting the cause. Bacopa monnieria and Ashwagandha are found to be better alternatives for removing the cause behind these central nervous system ailments.

REFERENCES

1. Tripathi, K. D. Essentials of Medical Pharmacology. 6th ed. New Delhi: Jaypee Brothers Medical Publishers(P) LTD. 2008.
2. Rang HP, Dale MM, Ritter JM, Roore PK, Pharmacology 6th edition. Philadelphia: Churchill Livingstone:2007.
3. Xueli Z, Yang Y, Zhou C, Shan L, Yunguo Z, Xiaoling Y, 2014. Antidepressant effect of chimonanthus salcifolicus essential oil in chronic stressed rats. J Medi. Plant Res. 8, 430-435.
4. Rang HP, Dale MM, Ritter JM, Roore PK, Pharmacology 6th edition. Philadelphia: Churchill Livingstone:2007.
5. Ferrari AJ, Charlson FJ, Norman RE, Patten SB, Freedman G, et al. (2013) Burden of Depressive Disorders by Country, Sex, Age,

and Year: Findings from the Global Burden of Disease Study 2010. PLOS Medicine 10(11): e1001547.

6. Jaya Preethi P, Padmini K, Srikanth J, Lohita M, Swetha K. Screening Models for CNS Stimulant Drugs: A Review. Asian J. Pharm. Res. 3(3): July-Sept. 2013; Page 151-155.
7. Rey JA. CNS Stimulants. In: Lippinott Illustrated reviews: Pharmacology. 6th edition, Wolters K, Philadelphia 2015; PP 215-224.
8. Ghani A. Medicinal plants of Bangladesh. The Asiatic Society of Bangladesh:Dhaka; 1998.
9. Sri neeraja, P. (2017). CNS stimulant property of natural products. International journal of reviews and research; 6(7), 739-742.
10. Ghedira K and Goetz P. (2017) Waterhygroscopic- Bacopa Monnieri (L.) Pennell (Plantaginaceae) Phytotherapies, 5(3), 164-168.
11. Tantra S.(2019) National journal of research in ayurveda science. National journal of research in ayurveda science, 7(2), 1-9.
12. Singh M, Bhalla M, Dejager P, and Eilia M. (2011). An overview on Ashwagandha : A rasayana of ayurveda. African journal of traditional , complementary and alternative medicines, 8(5 suppl), 208-213.
13. Anju(2011) Bacopa Monnieri_ A preliminary study evaluating Its anti-stress activity in swiss albino mice. Research journal of pharmaceutical biological and chemical sciences bacopa, 2(4), 786.

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