Shankhpushpi is a reputed drug of Ayurvedic system of medicine, which has been used for centuries as a brain and neural tonic, tranquilizer, and to reduce hypertension. All this is based on scripts and description in 'Charaka Samhita' and 'Susruta Samhita'. Does it really act? If Yes, then how? These questions still remain unanswered from the scientific viewpoint. A very few studies available are being discussed below:

Singh and Mehta (1977) reported the psychotropic effect of Shankhpushpi. 30 outdoor patients of anxiety neurosis were selected. They were given Shankhpushpi syrup in the dose of 30 ml per day in 3 divided doses (representing 50 g dry crude drug). The patients were reassessed on the following parameters of evaluate the effect of the treatment given after one month: (1) Clinical relief: the main symptoms scored in numbers by qualitative grading, (2) Psychological changes studied by (i) Total and differential anxiety level with the help of Middle Sex Hospital questionnaire, (ii) Neuroticism index as per MPI, (iii) Mental fatigue rate as per Joshi's digit cancellation test, (iv) Immediate memory span as per Joshi's digit renounce test, (3) Physiological changes viz. pulse rate, blood pressure and body weight, (4) Biochemical changes viz. plasma cortisol, urinary catecholamines. A significant symptomatic relief was observed after one month of treatment are in regard to the major symptoms like nervousness, insomnia, weakness and fatigue dyspepsia, and general feelings of not being well. The mental functions as estimated by (1) mental fatigue rate and (2) immediate memory span showed significant improvement. Thus the study confirmed the claimed effect of this herbal medicine as a brain tonic and memory enhancer.

Mudgal, Rai, Singh, and Udupa (1977) tested the immediate and cumulative tranquilizing effects of this herb, Neurohumoral changes were recorded as an index to study the status quo of brain. The aerial parts of Shankhpushpi were collected and the test extracts were prepared. Twenty four young albino rats were selected, and divided into four groups comprising of 6 rats in each group. Two types of experiments were as follows: (A) Short term experiments: (i) control
receiving only distilled water, (ii) treated group receiving one single injection of water soluble alcoholic extract of leaves and flowers of Shankhpushpi in the dose of 300 mg/kg weight intraperitonially one hour earlier to sacrifice. (B) Long term experiments: (i) control receiving only distilled water, (ii) treated group receiving the drug in the dose of 1.20 g/kg weight orally once in a day, for a period of 10 days. These rats were sacrificed on the 10th day. In the short term experiment Shankhpushpi treated group showed significantly lower levels of acetylcholine and histamine. Statistically there was no significant change found in the level of catecholamine in control and treated once. Shankhpushpi treated groups showed significantly lower levels of all the three neurohumors than control. This indicates a direct influence of Shankhpushpi on the central nervous system by the way of neurohumoral responses, thus strengthening the claim of Charak Samhita stating Shankhpushpi as a best neural tonic.

Ali (1998) conducted a study, which provides scientific support for antioxidant activities of extracts of Shankhpushpi and substantiates the traditional claims for the usage of these drugs in stress-induced disorders. They found that Shankhpushpi contains volatile oil, n-triacontane, higher fatty alcohols, kaempferal, its 3-D-glucoside, 2-3-dydroxycinnamic acid, B-sitosterol, carbohydrates such as glucose, rhamnose, sucrose, starch and potassium chloride, which enable the plant to be a brain tonic, in hypertension and as tranquilizer.

Shankhpushpi has been found to have the nootropic and neuroprotective effects, as claimed in the following studies:

Dhingra and Volecha (2007) conducted a study on Evaluation of the antidepressant-like activity of Convolvulus pluricaulis choisy in the mouse forced swim and tail suspension tests. This study investigates the effect of the petroleum ether, chloroform, and ethyl acetate fractions of the total ethanolic extract of Convolvulus pluricaulis Choisy (Family: Convolvulaceae) on depression in mice. The petroleum ether (25, 50 mg/kg), chloroform (25, 50, 100 mg/kg), and ethyl acetate (25, 50, 100 mg/kg) fractions were administered orally for 10 successive days to separate groups of Swiss young male albino mice. The effects of the extracts on the mice's immobility periods were assessed in the forced swim test (FST) and tail suspension test (TST). The effects of reserpine (2 mg/kg i.p.), sulpiride (50 mg/kg i.p.), prazosin (62.5 microg/kg i.p.), and p-chlorophenylalanine (100 mg/kg i.p.) on the extracts' antidepressant-like effect in TST was
also studied. The extracts' antidepressant-like effect was compared with that of imipramine (15 mg/kg p.o.) and fluoxetine (20 mg/kg p.o.) administered for 10 successive days. Only the chloroform fraction in doses of 50 and 100 mg/kg significantly reduced the immobility time in both FST and TST. This fraction did not have significant effect on locomotor activity. Its efficacy was found to be comparable to that of imipramine and fluoxetine administered for 10 successive days. The chloroform fraction reversed reserpine-induced extension of immobility period in FST and TST. Prazosin, sulpiride, and p-chlorophenylalanine significantly attenuated the chloroform fraction-induced antidepressant-like effect in TST. The chloroform fraction of the total ethanolic extract of Convolvulus pluricaulis elicited a significant antidepressant-like effect in mice by interaction with the adrenergic, dopaminergic, and serotonergic systems.

Bihaqi, Singh, Tiwari conducted a study in 2011. The study investigated the neuroprotective effect of Convolvulus pluricaulis aqueous extract (AE) against scopolamine (1 mg/kg body weight (bwt))-induced neurotoxicity in the cerebral cortex of male Wistar rats. The study was carried out on male Wistar rats (age matched, weight 250 ± 20 g). The present study investigated cognitive-enhancing property of AE using Elevated plus maze (EPM) (transfer latency [TL]) and Morris water maze (MWM). Besides evaluating the effect of extract on neurochemical enzymes, in vivo antioxidant and free radical scavenging activities were also screened. All the measured parameters were compared with rivastigmine tartrate (1 mg/kg bwt) which was taken as standard. Pretreatment of rats with AE (150 mg/kg bwt) significantly reduced scopolamine-induced increase in the TL in EPM, whereas in MWM, administration of extract improved the impairment of spatial memory induced by scopolamine. The activity of acetylcholinesterase (AChE) was significantly inhibited by extract within the cortex and hippocampus. Reduced activities or contents of glutathione reductase, superoxide dismutase, and reduced glutathione within the cortex and hippocampus induced by scopolamine were elevated by the extract. Taken together, it could be postulated that extract may exert its potent-enhancing activity through both anti-AChE and antioxidant action. AE possesses neuroprotective potential, thus validating its use in alleviating toxic effects of scopolamine.

Kothiyal and Rawat (2011) investigated the Comparative Nootropic effect of Evolvulus Alsinoides and Convolvulus Pluricaulis. The aim of the present study was to highlight the comparative nootropic effects of Evolvulus alsinoides and Convolvulus pluricaulis using two
validated models of memory namely jumping box and elevated plus maze. Rats were treated orally with vehicle (2% Tween 80 suspension), standard treatment (Piracetam, 200mg/kg body weight) respectively, one hour prior to the evaluation of behavioral parameters. The results indicate that alcoholic extracts of Evolvulous alsinoides exhibited superior nootropic activity as compared to Convolvulus pluricaulis in terms of time spent in the enclosed arm in plus maze model and the mean avoidance response on the jumping box model.

In the present study conducted by Verma, Sinha, Singh, Tanwar, Godara (2011) the antibacterial activity of methanolic extract of whole plant of Convolvulus pluricaulis was tested against Gram-negative bacteria like Escherichia coli ATCC 8739, and Gram-positive bacteria Staphylococcus aureus ATCC 6538, using Cup plate method with standard Tetracycline. The finding suggest methanolic extract of whole plant of Convolvulus pluricaulis has potent antibacterial activity against the pathogenic strains of Staphylococcus aeures and E.coli, exhibited significant wide spectrum of antibacterial activity against both Gram’s positive and Gram’s negative bacteria. From the study it was also concluded that Convolvulus. pluricaulis is more active against E. coli in comparison to S. aureus.

Medicinal plants is becoming an important part of Indian research. Shankhpushpi is herb that have been used in India for hundreds of years for many disorders such as stress, anxiety, insomnia, and so many diseases. Following is the review of such studies:

Indurwade and Biyani (2000) found that Shankhpushpi showed promise as a safe, effective remedy for anxiety. They conducted the research on 110 adults of age group 25- 45 years. The subjects were divided into two groups- one as experimental group and received Shankhpushpi treatment, where as the other group was control and received placebo. The treatment was continued for 4 weeks with doses of 120 mg daily. The assessment was done with the help of Hamilton Anxiety Scale (HAS) in before and after conditions. The findings showed that the experimental group experienced reduced anxiety than the control group.

Subramani, Anand, Muralidham (2005) studied the effect of Convolvulus Pluricaulis in Obsessive Compulsive Disorder. The study investigated the methanolic extracts of convolvulus pluricaulis (MECP) action on OCD with animal models by using invivo pharmacological evaluations such as Marble burying behavior, Hole board test, Rota- rod test using mice. They
used seven groups of mice. All the three tests were made on the seven groups. First group served as control. Second and third groups were treated with 15 mg/Kg and 30 mg/Kg of fluoxetine which is a standard drug and also it is a selective serotonin reuptake inhibitor (SSRIs). Then fourth and fifth groups were treated with 2.5 mg/Kg and 5 mg/Kg of diazepam which is an anxiolytic -sedative drug useful in the symptomatic relief of anxiety and tension states it serves as a negative control. Sixth and seventh groups were treated with 200 mg/Kg and 400 mg/Kg MECP. The results show that the MECP can modulate serotonin or dopaminergic levels, which is the major pathway of OCD pathophysiology.

Cerevenka and Jahodar (2006) conducted a pre- post, randomized, placebo- controlled study. As a sample, 30 patients with anxiety were given 30 ml of Shankhpushpi syrup daily for three months. Testing was done three times i.e. after 1 month, 2 months, and after 3 months of the treatment with the help of Hamilton Anxiety Scale. After one month, their anxiety levels decreased by 20 percent, after 2 months the effect of treatment was more visible and the patients felt significantly better, after the third testing, the anxiety levels of the patients was reduced by 56 percent. This was concluded that the herb Shankhpushpi is more effective when given for long duration.

Ernest (2006) conducted a study related to anxiety treatment. He gave 28 people of age group 28-50 years diagnosed with anxiety 50 mg daily of herbal formula with Shankhpushpi as a primary ingredient. The patients were diagnosed with Walmyr Clinical Anxiety Scale (WACS). After sixth months of the treatment, 91 percent of the patients felt reduced anxiety and 60 to 70 percent could sleep and concentrate better. Symptoms like nervousness also decreased.

Saeed, Bloch, and Antonacci (2007) examined the effect of herbal medicine Shankhpushpi on insomnia. They were given 10 mg dose of diazepam (an anti- anxiety drug), a placebo, or one of several forms of Shankhpushpi to 25 albino rats. The rats that received an alcohol extracts of Shankhpushpi slept for 74 minutes, significantly longer than those who were given the placebo (52 minutes) and only seven minutes less than those who took diazepam (81 minutes). Other forms of Shankhpushpi were not so effective.
Shankhpushpi have much relevance to many aspects of human life. It has been found to play a major role in memory, learning, other cognitive functioning, and other mental functions. Summary of some of the research papers is given below to support:

Prakash and Sinha (1988) studied the effect of Convolvulus microphyllus (a synonymous of Convolvulus pluricaulis) in complex cognitive task in terms of increment in peptide load in the brain. A total of 27 albino rats in three groups (thus having 9 rats in each group) were tested in Hebb-William Maze task with no obstruction, one, two and three obstructions. Time series-control group design was employed. The subjects were treated with injectable form of analog of nourepeptidergic substance (Sitosterol) obtained from Convolvulus microphyllus. It was observed that administration of 100 mg sitosterol 6 Hs. before training facilated the acquisition both in terms of time taken and errors committed. Similarly, the role of this drug as a promotor of the brain protein synthesis was confirmed when the subjects were treated before retention. After post experimental conditions the rats were sacrificed and the content of brain protein obtained. An increase in brain protein was found in all groups given the experimental treatment. This increment was due to administration of Convolvulus microphyllus.

Dubey, Pathak, and Gupta (1994) studied the confirmed effect of Brahmi (Bacopa monniera) and Shankhpushpi (Convolvulus pluricaulis) on memory and overall learning ability. Sixteen school going children (aged 10-19 years) selected on the basis of their poor educational performance were given these substances in doses of 200 mg daily for six months. An equal number of children served as control and received only placebo. A significant improvement in memory was observed in the Shankhpushpi treated group. None of the children showed any adverse effects.

In an empirical study, Priyanka and Batra (2003) investigated the role of Shankhpushpi in memory enhancement. This was a pre- post, double blind, placebo- controlled, parelled- group design based study. Sixty four subjects of age group 19-26 years were administered either Shankhpushpi or placebo for the period of 15 days and 30 days. The testing was done with the help of Forward Digit Span Task and Backward Digit Span Task, 30 words recall test and serial learning task before and after treatment. Results indicated that Shankhpushpi enhanced STM, LTM, Retrival and storage of the treated group. The placebo group’s score was found
insignificant on all the tests in both the durations. The study indicated that even 15 days were enough to see the improvement due to administration of Shankhpushpi.

Priyanka and Batra (2004) investigated the effect of Shankhpushpi on memory. In this study, a multi group, pre-post, double blind, placebo control design was employed. As a sample, 200 normal adults of age group 19-25 years were selected. The participants were divided into 10 groups (5 controls and 5 experimental groups). There were 20 subjects in each group. The subjects were given either 3.5 gm of Shankhpushpi or 3.5 gm of an ordinary powder with honey followed by a glass of milk for different durations (i.e. 15 days, 30 days, 60 days, 120 days, and 180 days). Forward digit span (FDS), Backward digit span (BDS), 30 words recall test, Serial learning task were taken for the testing. A memory enhancement (of both STM and LTM) after the duration of 30 days was observed. Results of the treatment for 120 and 180 days were found to be the best. The improvement went to increasing with an increased duration of administration of Shankhpushpi. It was concluded that Shankhpushpi enhanced memory and cognitive functions such as attention, storage and retrieval capacity of short term memory and long term memory, speed of learning, encoding for item to get registered in LTM. A residual effect was also observed after 60 days of the administration of Shankhpushpi except the complex task of serial learning, up to 2 months only. For complex task a residual effect after 120 days administration was observed up to 2 months. It was also important to be noted that there was found no side effect of Shankhpushpi even used for longer durations i.e. 180 days or up to six months even in a single subject.

Kapse (2005) had done single blind control clinical trial to assess cognition enhancing (Medhya) effect of Shankhpushpi (Convolvulus Pluricaulis) on 90 patients. For that study, Shankhpushpi tablets to group A was given in dose 3 gms/day in two divided doses for the duration of six months. Group B was control group in which tablets of Shankhpushpi bheda (Evolvulus alsinoides Linn) in same dose and duration was given. The group C was placebo group was received starch powder by same manner. The scales used for assessment of the effect were – (1) Behavior profile (i) Standardized symptom checklist (SSCL) (ii) Child Behavior checklist - Standard version (CBCLSV) (2) Effect of cognitive function by NVIT (3) Effect on mental faculties by NIMHANS proforma. Criteria of assessment were according to relief of symptoms of behavior disorders, improvement in functions of mana and reduction of
manodharniya Vega and improvement in PR. In this study Convolvulus pluricaulis type of shankhapi showed significant results due to its cognition enhancing (Medhya) and manasarogahar activity. The test drug showed effective relief in symptoms of behavior disorders of adolescent age group. It had been more effective in enhancing grasping capacity and intellectual power (Dhi and dhru ti).

Agarwal, Sharma, Rajamanickam, and Dubey (2006) conducted a research on Age Consistent Cognitive Decline - An Ayurvedic Pharmacological Management. As a sample, 61 aged subjects of both sex with an age range of 62-75 years were selected. 28 aged had cognitive deficits particularly the memory loss. Whereas 33 were normal aged. The subject of both group were treated with organic extract of Bacopa monnieri in effective doses continuously for six months and evaluated on various neuropsychological parameters. The results obtained at the end of six months revealed beneficial effect in improving memory and attention span and also associated behavioural problems among demented elderly people. The neuro-chemical loss was checked and enhanced in senile dementia cases. The test drug has potentiality to improve memory and other cognitive deficits among the aged suffering from dementia and associated behavioural problems.

Batra (2008) investigated the effect of Shankhpushpi on mentally retarded population. As a sample, 5 male mentally retarded subjects were selected out of 20 such Subjects on single and successive command test in Dementia Rating Scale (DRS-2) by Steven Mattis. Those who could follow these commands those 5 Subjects were selected. These subjects were administered upon FDS and BDS task to assess their short term memory and Quality of Life Scale by Meryl Brod. Now these Subjects were given Shankhpushpi daily and retested after 10 days and 45 days. The results clearly showed an improved memory and wonderful quality of life. The Subjects were also tested after 40 days of discontinuing the consumption of Shankhpushpi to a study of residual effect.

A study conducted in 2008 by Batra, Kumar, Rawat, and Batra examined the effect of Shankhpushpi on Short Term Memory and Long Term Memory. They conducted the research on a sample of 20 Ss studing in IX and X was selected. They were given 3.5g of Shankhpushpi powder for 40 days. These subjects were tested on FDS, BDS and Serial Learning Task before
and after the administration of Shankhpushpi. The measure were computed on each task for both duration, i.e. 20 and 40 days. Results indicated an improvement in both FDS and BDS. The number of trials taken in Serial Learning Task reduced. A retention test after 24 hrs of Serial Learning Task was also taken in both pre and post testing. There was an improvement in the number of items recalled. These results indicate that the Shankhpushpi improves both the Short Term Memory and Long Term Memory. The rate of improvement after 20 days of consuming Shankhpushpi was higher than the rate of improvement between 20 and 40 days.

Rajesh and Batra (2009) conducted a double-blind, pre-post, placebo controlled study. They investigate the effect of Shankhpushpi on dementia rating and quality of life amongst the patients of dementia. As a sample, 80 already diagnosed patients, 40 belonging to Senile Dementia of Alzheimer's Type (SDAT) and 40 belonging to Multi-infarct Type (MIT) were selected. They administered either Shankhpushpi powder or placebo (3.5gm/day) for a duration of 4 months. The participants were divided into 4 groups (2 control and 2 experimental groups). The assessment was done with the help of Dementia Rating Scale-2 (DRS-2) by Steven Mattis, to assess the levels of cognitive functioning for individual with brain dysfunction, and Dementia Quality of Life Instrument (DQoL) by Meryl Brod, to assess the quality of life of patients with dementia. The patients were assessed three times, i.e. firstly in the starting, then after 2 months, and then after 4 months administration of herbal medicine. The herbal medicine Shankhpushpi led to an improvement in both types of dementia. It was found that on DRS-2, most of the dimension such as attention, initiation/perseveration, conceptualization showed significant improvement due to administration (both duration) of Shankhpushpi. It is observed in total scores of DQoL, Shankhpushpi improved the quality of life both dementia type after 2 and 4 months. It was also found that Shankhpushpi improved self-esteem, positive affect, feelings of belonging significantly. And, on many tasks, the effect goes on increasing with the increasing duration.

Rawat and Kothiyal (2010) investigated the neuropsychopharmacological effects of various reported species of Shankhpushpi - Evolvulous alsinoides Linn., Convolvulous pluricaulis Sieb., and Clitorea ternatea Linn. on learning and memory processes. Morris Water maze was employed to evaluate learning and memory parameters. Alcoholic extract of Evolvulous alsinoides Linn., Convolvulous pluricaulis Sieb. and Clitorea ternatea Linn. were
prepared and administered to rats per oral, at a dose of 250 and 500 mg/kg body weight. Piracetam (200 mg/kg body weight ip) was used as standard drug. The animals were subjected to training for eight days. At the end of trial session the animals were subjected to spatial memory test by measuring the time spent in the target quadrant. Amongst the three species of Shankhpushpi ethanolic extract of Evolvulus alsinoides seemed to be the best since time spent in target quadrant after the training session was the maximum. Results indicate that all the three species exhibited a dose dependent nootropic effect.

Shah and Goyal (2010) conducted a study on Comparative clinical evaluation of herbal formulation with multivitamin formulation for learning and memory enhancement. The objective of the study was to clinically evaluate polyherbal formulation (PHF) and compare with multivitamin (MH) preparations used as learning and memory enhancer. It was randomized, placebo controlled, double blind clinical study approved by Institutional Human Ethics Committee. Forty-seven healthy human volunteers from colleges of Mehsana (18-24 years) ready to sign informed consent form were included in study. All these subjects were given either on capsule of placebo or two capsules of PHF (500mg) at night or MV (500mg) 1 capsule two times a day for a period of three months. They were monitored for neuropsychological tests initially, after first and third month of active treatment with PHF/MV. Results showed that there was significant increase in IQ score and short term memory score in PHF treated group between 0 and 90 days treatment. In the other battery test significant alterations were observed in all three groups. Our data suggest both PHF and MV supplementation specifically improves learning and memory as compared to placebo in healthy young subjects. PHF appears to be more active than MV.

The present study Cognition boosting effect of Canscora decussata (a South Indian Shankhpushpi) conducted by Sethiya, Nahata, Dixit, Mishra (2011) investigated the effect of Canscora decussata Schult (CD), which is regarded as Shankhpushpi, for its effects on learning and memory in rodents. The extract was further studied for its in vitro acetylcholinesterase (AChE) inhibitory potential which can correlate with its cognition boosting effect. Ethanol extract of CD was analyzed by high performance thin layer chromatography (HPTLC) and high performance liquid chromatography (HPLC). Ethanol extract of CD was investigated for its AChE enzyme inhibitory activity. Nootropic activity using Elevated plus maze apparatus,
passive avoidance (Cook and Weidley’s pole climbing, step down) paradigms and active avoidance (two compartment shuttle box) test were used to learning and memory. HPTLC and HPLC fingerprinting of ethanol extract revealed presence of mangiferin as its main constituent. It was found that CD potentially inhibits AChE with 50% inhibitory concentration (IC50) of 165.667 ± 0.213 mg/ml. It was found that groups (n = 6), receiving ethanol extract in doses of 200 and 400 mg/kg p.o. significantly reversed the amnesia induced by scopolamine (0.3 mg/kg i.p.). Nootropic activity was compared using piracetam (100 mg/kg p.o.) as the standard. Ethanol extract of CD showed significant effects on learning behavior and memory enhancement as evidenced from the experiments performed. The activity may be attributed to the presence of various xanthones and mangiferin, a polyphenolic xanthone.

Not much research has been published on Shankhpushpi. There are limited studies on the herb, which throw light on its cognition enhancing properties. To conclude the review of various studies it is clear that Convolvulus pluricaulis (CP) has been widely screened for its various pharmacological activities. It has relatively well documented neuropharmacological actions such as nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilising and sedative activities which justify its use in CNS diseases in the Ayurvedic system of medicine. It has antimicrobial, antipyretic, anti-inflammatory, analgesic, diuretic, antidiabetic and insecticidal properties. The various reported pharmacological activities of Convolvulus pluricaulis highlight the therapeutic potential of Convolvulus pluricaulis and limitations in our knowledge of its claimed traditional Indian usage. With this background one may now proceed towards the formulation of problem and hypotheses for the study.